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The separate section on "On-going Research Projects" has been eliminated from this issue. The Smithsonian Science Information Exchange (SSIE) ended its work October 1, 1981, and transfer of such efforts to the National Technical Information Service (NTIS) has not been completed. NASA plans to resume this section in an early issue of *STAR* Volume 20 (1982). Comments on this section and its usefulness are welcome and should be sent to the NASA Scientific and Technical Information Branch (NST-44), Washington, DC 20546.

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3302

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20 SPACECRAFT PROPULSION AND POWER 3303
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For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

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23 CHEMISTRY AND MATERIALS (GENERAL) N.A.
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85 URBAN TECHNOLOGY AND TRANSPORTATION 3427
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3429

89 ASTRONOMY 3430
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3431
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3431
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS N.A.
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3432
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 3433

Note: N.A. means that no abstracts were assigned to this category for this issue.

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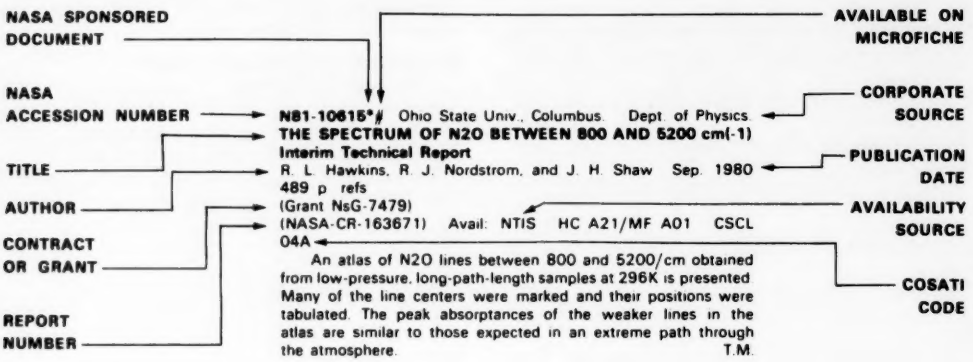
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N81-10615*# Ohio State Univ., Columbus. Dept. of Physics
CORPORATE SOURCE
THE SPECTRUM OF N2O BETWEEN 800 AND 5200 cm(-1)
TITLE
Interim Technical Report
PUBLICATION DATE
R. L. Hawkins, R. J. Nordstrom, and J. H. Shaw Sep. 1980
489 p refs
AUTHOR
(Grant NsG-7479)
AVAILABILITY SOURCE
CONTRACT OR GRANT
(NASA-CR-163671) Avail: NTIS HC A21/MF A01 CSCL 04A
COSATI CODE
An atlas of N2O lines between 800 and 5200/cm obtained from low-pressure, long-path-length samples at 296K is presented. Many of the line centers were marked and their positions were tabulated. The peak absorptances of the weaker lines in the atlas are similar to those expected in an extreme path through the atmosphere. T.M.
REPORT NUMBER

VOLUME 19 NUMBER 24/DECEMBER 23, 1981

Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N81-33124* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 139
Sep. 1981 117 p
(NASA-SP-7037(139)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 381 reports, articles, and other documents introduced into the NASA scientific and technnical information system in July 1981. Author

N81-33125# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung.
SEMINAR ON THE SIMULATION AND OPTIMIZATION OF DYNAMIC SYSTEMS (WINTER TRIMESTER 1981) [SEMINAR UEBER SIMULATION UND OPTIMIERUNG DYNAMISCHER SYSTEME WINTERTRIMESTER 1981]
Jun. 1981 172 p refs Partly in GERMAN and ENGLISH Presented at Munich, 1981
Avail: NTIS HC A08/MF A01

Simulation and optimization of aircraft and satellite control systems are discussed. Parameter identification for controlled aircraft flights was studied, with applications of the maximum liklihood method. For individual titles, see N81-33126 through N81-33132.

N81-33126# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
CONTROL SYSTEM DESIGN BY OPTIMIZATION OF A VECTORIAL QUALITY CRITERIUM [REGLERENTWURF DURCH OPTIMIERUNG EINES VEKTORIELLEN GUETEKRITERIUMS] **c08**
R. Steinhauser *In* Hoschschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 1-18 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

An iterative control design procedure is presented which optimizes the design requirements constituting the quality vector criterium. The design philosophy and theory are outlined. The free control parameters of a given control system are chosen in such a way that a systematic improvement of the result is guaranteed from design step to design step, also when very many design requirements have to be taken into account.
Author (ESA)

N81-33127# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Hauptabt. Raumflugmissionen.
PHYSICAL SIMULATIONS IN SATELLITE DYNAMICS **c15**
R. Stapf *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 21-41 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

The hybrid technique, combining air bearing platform simulation with computer-aided simulation of the flexible parts is described. The problems posed by internal and external torques, gravity and limited simulation time are reviewed. Parameter scaling for moments of inertia, disturbance and control torques, drift angles and simulation time are discussed. The simulation of a pure reaction jet attitude control system and an attitude control system with fixed momentum wheel are detailed. Scaling methods for fine pointing and roll/yaw coupling are shown. Pointing accuracies of 0.001 deg were obtained for the reaction jet simulation. Author (ESA)

N81-33128# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
MAXIMUM LIKELIHOOD IDENTIFICATION USING KALMAN-FILTERING VERSUS LEAST SQUARES ESTIMATION **c64**
G. Schulz *In* Hochschule der Bundeswehr Seminar On the Simulation and Optimization of Dyn. Systems Jun. 1981 p 42-51 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

A least squares and a maximum likelihood identification method applied to real flight test data of an HFB-320 aircraft are compared on the basis of dimensional system parameters. The system and gust models are discussed and the identified parameters compared to their wind tunnel values. The maximum likelihood method is shown to be superior. The nondimensional system parameters are then identified using the maximum likelihood technique and the results are analyzed with respect to their convergence properties. Author (ESA)

N81-33129# Freie Univ., Berlin (West Germany).
A HYBRID METHOD FOR THE AUTOMATIC SPECIFICATION OF RATIONAL TRANSFER FUNCTION MODELS WITH ARIMA-AUTOCORRELATED ERRORS SUPERIMPOSED **c64**
H.-J. Lenz *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 52-68 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

A data-guided specification of rational transfer function modeling is suited for a trial-and-error approach. However, this does not necessarily imply a manual model specification. Consequently, the specification may be done fully automatically using a three-pass algorithm. In the first pass the orders of the polynomials of the transfer function are tentatively chosen by a pattern recognition technique, and the model parameters estimated. In the second pass the orders of polynomials for the noise model are estimated from the residuals using a combinatorial order search method. Finally, in the third pass all the involved parameters are estimated simultaneously as usual, and the goodness of fit is checked. If necessary, the algorithm starts iterating through the three passes until at least one of the embedded stopping rules is fulfilled. Author (ESA)

N81-33130# Technische Universitaet, Munich (West Germany).
IDENTIFICATION OF NONLINEAR AERODYNAMIC EFFECTS FROM FLIGHT TEST MEASUREMENTS [IDENTIFIKATION NICHTLINEARER AERODYNAMISCHER EFFEKTE AUS FLUGVERSUCHSMESSUNGEN] **c02**
H. Schaeufle *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 69-101 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

A parameter identification procedure, in the frame of flight test measurements and based on the maximum likelihood principle, is described. During the flight tests the location of maneuver points was found to depend on the position angle. Calculating the points requires in this case the use of derivatives obtained with the help of parameter identification from dynamic maneuvers. Nonlinear behavior of the spoiler performance was qualitatively observed. The procedure for quantitatively registering this nonlinear behavior is explained. During the lateral motions of an aircraft position angle dependence of the aerodynamic moments occurs in certain flying ranges. Author (ESA)

N81-33131# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
DESIGN OF OPTIMAL INPUTS FOR THE IDENTIFICATION OF CHARACTERISTICS OF AIRCRAFT FLIGHTS [ENTWURF VON EINGANGSSSIGNALEN FUER DIE KENNWERTERMITTLUNG BEI FLUGZEUGEN] **c05**
E. Plaetschke *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 102-120 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

The design of optimal inputs for identifying stability and control derivatives of the longitudinal and lateral motion of an aircraft are considered. Two different procedures of input design were treated in more detail. Starting with investigations in the frequency domain, the first method yields a multistep input signal, which fulfils specific spectral requirements. Compared with the power spectral densities of the commonly used double and single step input, this multistep input has a larger bandwidth. The second method is based on the optimization of different measures of the Fisher information matrix, such as determinant or trace. Depending on the measure used, the designed signals differ with respect to their spectral composition. The discussed input signals, which were used in a flight test program, are compared with respect to the achieved accuracy of the identified stability and control derivatives. Author (ESA)

N81-33132# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
SYSTEM IDENTIFICATION FOR CONTROLLED AIRCRAFT [SYSTEMIDENTIFIZIERUNG AM GEREGELTEN FLUGZEUG] **c05**
M. Marchand *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 121-166 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

The problems and experiences in applying a maximum likelihood identification method to the flight test data of a controller-supported aircraft are reported. The effect of the controller on the identifiability of the parameters and the validity of the model structure of a so-called equivalent system are treated. The role of the pilot in the control loop, e.g., with respect to stability, and the identification of pilot models is addressed.
Author (ESA)

N81-33133# RAND Corp., Santa Monica, Calif.
ESTIMATING AIRCRAFT DEPOT MAINTENANCE COSTS Interim Report
Kenneth E. Marks and Ronald W. Hess Jul. 1981 214 p
(Contract MDA903-77-C-0107)
(AD-A103623; RAND/R-2731-PA/E) Avail: NTIS
HC A10/MF A01 CSCL 05/1

This report describes a series of parametric equations for use in estimating the depot maintenance cost of new Air Force aircraft, particularly for the five major maintenance categories: airframe rework, engine overhaul, airframe component repair, engine component and accessory repair, and avionics component repair. The equations are intended to provide cost estimates for Defense Systems Acquisitions Review Council Milestone II, at which point some design details of major aircraft subsystems (airframes, engine avionics) are available. The report presents a single set of equations that are the most representative and applicable to the widest range of estimating situations, but presents alternative equations and supporting data and analyses. Author (GRA)

N81-33134# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A STUDY OF THE FACTORS AFFECTING PRODUCTIVITY AT THE NAVAL AIR REWORK FACILITIES M.S. Thesis
Janice Allton and Stephen N. Bernard Jun. 1981 83 p refs
(AD-A103783; AFIT-LSSR-10-81) Avail: NTIS
HC A05/MF A01 CSCL 05/1

The purpose of this study was to determine the factors affecting productivity at Naval Air Rework Facilities (NARFs). Specific points addressed were number and identity of factors, internal consistency and usefulness in predicting perceived productivity. A seventy-two item questionnaire was administered to a random sample of NARF production-line employees. Five hundred thirty-four cases were factor analyzed. Eleven factors extracted were discussed. Eight of these were used to develop a linear multiple regression model to predict perceived productivity. Approximately twenty percent of the variance in perceived productivity was predicted, with five independent variables (factors) work scheduling supervision, overtime, training quality and equipment. These factors generally substantiated those found in current literature. Author (GRA)

N81-33135# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A PRESCRIPTIVE MODEL FOR RESOURCE ALLOCATION AT THE INTERMEDIATE LEVEL ENGINE FACILITY M.S. Thesis
Edward Connolly and Charlie D. Johnson Jun. 1981 91 p refs
(AD-A103785; AFIT-LSSR-26-81) Avail: NTIS
HC A05/MF A01 CSCL 15/5

Inability to support spare engine requirements has a critical impact on this nation's ability to meet its worldwide commitments during a crisis. This study examined those factors that significantly affect the intermediate level Propulsion Branch's ability to provide a steady supply of spare engines. Through simulation modeling and analysis, four factors were identified as driving the Base Repair Cycle time: spare parts, repair equipment, manpower, and experience level. A decision support system was developed which enables most users to assess the influence on repair cycle time of additional funding levels in specific factor areas.
Author (GRA)

N81-33136# Boeing Aerospace Co., Seattle, Wash. Product Support/Experience Analysis Center.
DEVELOPMENT OF MAINTENANCE METRICS TO FORECAST RESOURCE DEMANDS OF WEAPON SYSTEMS Final Report, 1 Mar. 1978 - 1 Oct. 1980
Donald K. Hindes, Gary A. Walker, and David H. Wilson Wright-Patterson AFB, Ohio Air Force Human Resources Lab. Oct. 1980 154 p refs
(Contract F33615-77-C-0075)
(AD-A104089; D194-10089-5) Avail: NTIS
HC A08/MF A01 CSCL 05/1

This report describes the methodology and results of a 32 month effort to 'Develop Maintenance Metrics To Forecast Resource Demands of Weapon Systems'. Increased concern with the rising cost to support weapon systems currently in operation, as well as those in development, has created the need for more accurate methods of projecting maintenance requirements. The objective of this subject research was to alleviate the above need by identifying, determining, and integrating those measurable weapon system parameters which are necessary and sufficient to predict and quantify the drivers of maintenance resource demands. Phase 1 investigated and developed new maintenance metrics for aircraft propulsion and avionics. Phase 1 results

were then reviewed for overall success and applicability before proceeding with Phase 2 efforts. Initial results were acceptable so Phase 2 of the study was initiated to develop metrics for the rest of the subsystems commonly included in Air Force aircraft. This document is the final report of a series of five technical reports published during the study. It is intended to be a summary overview of the study project and an application guide for potential users of the developed metrics methodology. Study findings include: (1) Review of published literature; (2) Critical equipment selection; (3) Maintenance impact parameter identification; (4) Data base assembly and integration; (5) Maintenance impact estimating relationship detection and analysis; (6) Maintenance metric model development; and (7) Maintenance metrics validation. GRA

N81-33137# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE IMPACT OF MILITARY APPLICATIONS ON ROTORCRAFT AND V/STOL AIRCRAFT DESIGN
Jun. 1981 264 p refs In ENGLISH and FRENCH Conf. held at Paris, 6-9 Apr. 1981
(AGARD-CP-313; ISBN-92-835-0294-9) Avail: NTIS HC A12/MF A01

The technological status of rotorcraft and V/STOL aircraft were reviewed in light of operational possibilities and needs. Topics include operational experiences, present status of technology, future trends, and military mission effectiveness. For individual titles, see N81-33138 through N81-33156.

N81-33138# French Army, Villacoublay-Air (France).
INCIDENTS OF PROBLEMS IN SETTING TO WORK ON THE CONCEPTUAL DESIGN OF HELICOPTERS [INCIDENCES DES PROBLEMES DE MISE EN OEUVRE SUR LA CONCEPTION DES HELICOPTERES]
M. G. Cannet *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 12 p In FRENCH (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

The problems focused on concern only the development and design of military helicopters. The general operational requirements of today's military helicopter were reviewed. The immediate problems facing the helicopter industry are discussed. Technological forecasts for the next 20 years are presented with emphasis on the direction that research management will take in helicopter design. T.M.

N81-33139# Martin Marietta Aerospace, Bethesda, Md.
VERTICAL LIFT CAPABILITIES FOR THE 80'S AND 90'S
Norman R. Augustine and James B. Morrison *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 16 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

During the past few years, several things have happened to make vertical lift more attractive. The first is that the technologies in engines, structures, stability and control and avionics have all been improving rapidly, producing great strides in performance, maintainability and potential cost reduction. The second is that the facts of operational life have changed to put additional value on vertical takeoff and landing capability. The status of battlefield vertical lift systems in the United States in reference to the level of technology, mission capabilities and associated development activities is reported. Also, projections in each of these areas are presented, accompanied by a list of recommendations based on the perceived pitfalls in the past and the technological and mission opportunities of the future. T.M.

N81-33140# Marine Corps, Washington, D. C.
TEN YEARS OF US MARINE CORPS HARRIER OPERATIONS
R. A. Gustafson *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 p 10 (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

The VSTOL concept is exceptionally attractive to the Marine Corps because of the significant benefits to expeditionary capability and reduced close air support response times made possible through basing flexibility. The AV-8A was employed world-wide by the Marine Corps aboard ship and ashore. Although the primary purpose of the AV-8A is to provide close air support to the Marine ground combat element, the thrust-vectoring design of the Harrier proved to have significant potential in air combat maneuvering. Operations with the AV-8A highlight areas where future VSTOLs should be improved as well as providing an experience base to support their design. This operational experience proves the VSTOL concept, and the Marine Corps is convinced that significantly increased combat effectiveness is provided. To further expand the VSTOL application, the Marine Corps plans to replace its present eight light attack squadrons with an improved Harrier, the AV-8B. The long term goal is to achieve an all VSTOL aviation force. T.M.

N81-33141# Army Aviation Center, Fort Rucker, Ala.
FIELDING OF AN ADVANCED HELICOPTER. THE UH-60A BLACK HAWK: INITIAL OPERATIONAL EXPERIENCE
Cornelius F. McGillicuddy, Jr. *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 10 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

The Sikorsky UH-60A was developed and designed to replace the UH-1H Iroquois for assault, air cavalry, and aeromedical evacuation missions. The UH-60A carries the infantry squad of 11 men and their equipment as a basic load. Particular emphasis during development was devoted to reducing vulnerability, improving crashworthiness and maintainability. There are eight separate kits for the basic aircraft which increase mission flexibility. The development of the UH-60A was highly successful as have the initial operational experiences. The Black Hawk was issued to operational units and these units deployed and engaged in field exercises both in and outside of the United States. The lessons derived from these operational experiences will assist in improving the UH-60A and defining roles for future utility aircraft. T.M.

N81-33142# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
VIEWS ON V/STOL TACTICAL FIGHTER AIRCRAFT: TECHNOLOGY NEEDS AND RELATIONSHIPS TO THE RUNWAY DENIAL PROBLEMS
John M. Byrnes, G. Keith Richey, and Randall B. Lowry *In* AGARD The Impact of Mil. App. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 13 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

On the basis of a number of studies conducted over the past three or four years, the Air Force technology community developed an intense concern over the vulnerability of USAF airbases, particularly those in Central Europe. For this reason, advanced concepts which may help solve the problem in the near and far terms are addressed. A possible airbase survivability plan is presented, and the pros and cons of STOL versus V/STOL aircraft, as a far term solution, are discussed. T.M.

N81-33143*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HISTORICAL OVERVIEW OF V/STOL AIRCRAFT TECHNOLOGY
Seth B. Anderson *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 13 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01 CSCL 01B

During the past 25 years over 60 V/STOL types were studied and flown with varying degrees of success. The requirements for satisfactory characteristics in several key technology areas are discussed and a review is made of various V/STOL aircraft for the purpose of assessing the success or failure of each design in meeting design requirements. This survey shows that in spite of many problems revealed, special operating techniques were developed to help circumvent deficiencies. For the most part performance and handling qualities limitations restricted operational evaluations. Flight operations emphasized the need for good STOL performance, good handling qualities, and stability and control augmentation. The majority of aircraft suffered adverse ground effects. T.M.

N81-33144*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

RECENT PROGRESS IN V/STOL AIRCRAFT TECHNOLOGY

L. Roberts, W. Deckert, and D. Hickey *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 10 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01 CSCL 01B

Recent results from wind-tunnel and flight-tests investigations for V/STOL aircraft were reviewed. Primary emphasis is given to technical results relating to three types of subsonic aircraft: a quiet STOL aircraft; a tilt rotor aircraft, and a turbofan V/STOL aircraft. Comparison and correlation between theoretical and experimental results, and between wind-tunnel and flight-test results, is made. The quiet STOL aircraft technology results are primarily those derived from the NASA/Boeing Quiet Short Haul Aircraft (QSRA) program. The tilt rotor aircraft technology results are those obtained from the NASA/Army/Navy/Bell (XV-15-TRRA) aircraft flight investigations. The turbofan V/STOL aircraft technology results are from static ground facility and wind-tunnel investigations of a NASA/Navy/Grumman full-scale lift/cruise fan aircraft model, which features two tilting nacelles with TF-34 engines. T.M.

N81-33145# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Helicopter Div.

CONTROLS AND DISPLAYS FOR ALL-WEATHER OPERATION OF HELICOPTERS c08

R. D. vonReth *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 15 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Various mission requirements for all weather operations were reviewed. In particular some of the most important features for military applications are outlined. Some of the basic relations between increasing display sophistication and increasing control sophistication are discussed. Also the influence of various functions on the degree of control automation as it seems desirable for future systems under the aspect of man-machine interaction are taken into consideration. In a comparison the controls and displays arrangement of some representative helicopters of presently operational helicopters are described. An outline of the goals and results of some experimental and research programs is given. The characteristics of presently operational helicopters are compared with the technologically feasible solutions taking into account some of the economic constraints as initial cost, operational cost and reliability. Future basic requirements for the controls and the displays operation are established. T.M.

N81-33146# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE ROLE OF THE RESEARCH SIMULATOR IN THE SYSTEMS DEVELOPMENT OF ROTORCRAFT c09

Irving C. Statler and Arlin Deel *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 21 p refs Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif. (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01 CSCL 14B

Over the last 20 years, flight simulators became widely accepted as training tools. Moreover, research simulators were used extensively by the fixed-wing industry: in the design, testing, and certification of new aircraft. The rotorcraft industry, however, was slow to use man-in-the-loop simulation to solve its design problems, primarily because of the difficulty of modeling complex rotorcraft for realtime simulation and because of the need for a wide-angle visual system for low-level flight. A joint U.S. Army and NASA program was initiated to provide this simulation capability for exploitation by both government and industry. The potential application of the research simulator to future rotorcraft systems design, development, product improvement evaluations, and safety analysis is discussed. T.M.

N81-33147# Societe Nationale Industrielle Aerospatiale, Marignane (France.)

APPLICATIONS OF COMPOSITE MATERIALS FOR THE CONSTRUCTION OF MILITARY HELICOPTERS [APPLICATIONS DES MATERIAUX COMPOSITES POUR LA CONSTRUCTION D'HELICOPTERES MILITAIRES] c24

A. Sourdon and G. Beziac *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 21 p refs In FRENCH (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Production costs and versatility of the construction materials are the guiding factors for aircraft construction techniques. The ever increasing use of composite materials in aircraft construction is a result of these factors. The utilization of composite materials in helicopter construction is discussed. Special emphasis is placed on the advantages and disadvantages of the use of these materials for military helicopters. T.M.

N81-33148# Institut fuer Flugmechanik, Brunswick (West Germany).

THE IMPACT OF HELICOPTER FLIGHT MECHANICS ON MISSION PERFORMANCE c05

B. L. Gmelin and H.-J. Pausder *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 14 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

In comparison to other VTOL aircraft, the helicopter has inherently superior flying characteristics at hover and in the low speed region but it has clear disadvantages by its lower high speed capability. For the completion of today's military helicopter missions near the ground and in all weather flight conditions a careful flight mechanical adaptation of the pilot-helicopter system to the specific task is required. This includes the combined optimization of the basic aircraft, the additional system equipment, and in a certain degree the pilot control behavior. A DFVLR-methodology is presented, having the objective to evaluate the flight mechanical characteristics of the pilot-helicopter system with regard to specific flight tasks. The method leads to taskoriented evaluation diagrams which include scales for the overall system task performance and for the demands on the pilot. Relevant flight test results of the BO 105 helicopter in hover and NOE-flight are presented. Especially the parameters control activity and task performance are discussed. Author

N81-33149# Rolls-Royce Ltd., Bristol (England).

MULTI-MISSION STOVL WITH VECTORED THRUST ENGINES c07

W. J. Lewis and P. Simplin (Rolls-Royce Ltd., Derby, England) *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 9 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

It is demonstrated how a single vectored thrust engine with plenum chamber burning on the front nozzles can be used in both a subsonic strike and a supersonic air superiority aircraft. The operational capability of the STOVL aircraft was compared with CTOL aircraft powered by an advanced turbofan of similar technology. It is also demonstrated that, when operated on the European environment, the STOVL aircraft when sized and operated in a manner which takes advantage of their specialized capabilities, have higher levels of mission effectiveness compared to the CTOL designs. Author

N81-33150# Textron Bell Helicopter, Fort Worth, Tex. Tilt Rotors.

MISSION POTENTIAL OF DERIVATIVES OF THE XV-15 TILT ROTOR RESEARCH AIRCRAFT c05

Kenneth G. Wernicke *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 9 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Outstanding low- and high-speed performance and flight characteristics were demonstrated and measured on the XV-15 tilt rotor research aircraft. Although the XV-15 was designed specifically as a research vehicle, it has the potential, with suitable modifications, to evolve into a productive aircraft for other missions. An increase in blade chord and installation of current state-of-the-art engines increase payload and significantly reduce fuel consumption. A third engine is installed on top of the fuselage to provide good one-engine-inoperative performance. A new fuselage is used for gunship missions. Derivative aircraft and the required changes for commerical and military applications are described. It is shown that the XV-15 derivatives are competitive with existing aircraft. Some of the derivative aircraft

can perform missions not possible with airplanes or helicopters by use of the unique high-speed/long-range VTOL capability and the highly-flexible flight envelope of the tilt rotor aircraft.
Author

N81-33151# Sikorsky Aircraft, Stratford, Conn.
ADVANCING BLADE CONCEPT HELICOPTER MISSION CAPABILITIES **c05**
Robert Zincone and Arthur W. Linden *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 16 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Today there are several ongoing research programs aimed at combining speed with helicopter attributes in a single vehicle. There is a growing recognition of a need for such aircraft and an active reexamination of the value of speed, the value of helicopter attributes (hover and low speed performance) and the trade-offs between these. Key attributes of interest to military users are: Battlefield survivability - ballistic, acoustic, radar cross section, IR signature; high speed flight while preserving low speed handling qualities equal to those of modern combat helicopters; compact design with low inertia, yielding high angular rates and precise control in all axes; high acceleration and deceleration capability; carrier and small ship compatibility, with good, low speed platform stability; superior one engine inoperative performance and safety; and field level maintainability with rugged reliability and maintainability attributes owing to simplicity of design. The Advancing Blade Concept helicopter has recently completed a feasibility demonstration phase showing that these attributes can be achieved in future aircraft designs. Author

N81-33152# De Havilland Aircraft Co. of Canada Ltd., Downsview (Ontario).
V/STOL AIRCRAFT TECHNOLOGY IN CANADA
D. C. Whittley *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 9 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Some principles being applied to research in relation to advanced STOL and V/STOL concepts are described. In particular, consideration is given to the supercritical augmentor flap configuration and to a fuselage ejector-lift VTOL concept. L.F.M.

N81-33153# Societe Nationale Industrielle Aerospatiale, Marignane (France.)
THE CONSEQUENCES OF CERTAIN OPERATIONAL REQUIREMENTS ON THE CONCEPTUAL DESIGN OF COMBAT HELICOPTERS [LES CONSEQUENCES DE CERTAINES EXIGENCES OPERATIONNELLES SUR LA CONCEPTION DES HELICOPTERES DE COMBAT]
Jean-Pierre Dubreuil *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 10 p In FRENCH (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

Three areas of helicopter design were examined: helicopter performance engineering; operational requirements for combat; and instrumentation. Helicopter performance is discussed in terms of controllability and flight speed. Operational characteristics include detectability, vulnerability, and survivability. The avionics are addressed in terms of man machine systems and display devices. T.M.

N81-33154# Costruzioni Aeronautiche Giovanni Agusta S.p.A., Varese (Italy).
DESIGN FOR MAXIMUM EFFECTIVENESS IN THE NAVY ROLE
Paolo Bellavita *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 20 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

The tremendous increase of the submarine threat in terms of speed, depth and weapon systems has forced the navies to review the concepts followed until today for the anti submarine warfare (ASW). Particularly for the peculiar Mediterraneum environment new operational requirements for typical helicopter ASW missions must be developed taking also into account the future availability of low frequency, high range Sonar. To get the maximum profit from this technological improvement, missions should be planned with unusual long time in the search area both in terms of longer hovering and longer Time on Station many miles from the home ship in connection with high air temperature, wind absence, high rotor thrust margin and complete fly away capability in case of engine failure during sonar operation. The optimization of the helicopter design parameters to achieve the maximum effectiveness in the ASW role within the Italian Scenario and the engineering parametric techniques used are described. Author

N81-33155# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE IMPACT OF OPERATIONAL REQUIREMENTS ON THE COMPROMISE OF DESIRED FEATURES IN ROTORCRAFT DESIGN **c05**
Klaus F. M. Schymanietz *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 17 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

The increase of influence for helicopters in military missions can be related to more diversification as well as special designed types. General valid aspects include the all-weather capability, high performance and agility, low vulnerability and detectability and all together high mission effectiveness. The addressed systems can be divided in three areas, the design of the dynamic systems including the rotor- and propulsion-system, the structural design, and the design of the equipment systems. In the first area, the dynamic systems and components, the general, i.e., civil and military, trend is to be seen towards more economy, use of advanced materials, aerodynamic efficiency etc. In the military field in addition high agility, i.e., high maneuverability and high installed power, is required. Derived from the mission task high demands are set in the structural field, esp. the crashworthiness, i.e., high energy absorption by constructional means and specific materials. Dependent on operational requirements as all-weather capability, autonomous navigation, automatic hover the field of equipments of today's and future weapon systems becomes more and more important and complex.
Author

N81-33156# National Academy of Sciences - National Research Council, Washington, D. C. Assembly of Engineering.
US MILITARY V/STOL: WHO NEEDS IT? WANTS IT? CAN AFFORD IT?
David C. Hazen *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 7 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

For a period of thirty years, fixed wing V/STOL technology has been under development. Of all the concepts investigated, only the vectored thrust approach employed in the AV-8A Harrier has found application in the combat forces of the Western World. This application was itself more the result of a technology push than of any clearly perceived operational pull. Once incorporated in operational units, however, the flexibility of basing displayed by the Harrier led to the evolution of entirely new operation concepts--and the requirement for improved aircraft to meet them. There are clear indications that the vulnerability of aircraft bases both ashore and afloat may make the V/STOL option essential in the future. Constrained by limited budgets and unimpressed by the performance currently available from V/STOL machines, the U.S. Services, other than the Marines, have no plans for introducing V/STOL into their forces, preferring instead to keep the technology on the shelf for future applications. If, however, V/STOL is to be effective in meeting future needs, the operational experience and doctrine to employ it must be developed now to guide the design of the machines that will be required. It is becoming increasingly critical that this Catch 22 be broken--and soon. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N81-33157*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PREDICTION OF BLADE-VORTEX INTERACTION NOISE FROM MEASURED BLADE PRESSURE

Yoshiya Nakamura Sep. 1981 22 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif.

(NASA-TM-81320; A-8692; USAAVRADCOM-TR-81-A-24; Paper-32) Avail: NTIS HC A02/MF A01 CSCL 01A

The impulsive nature of noise due to the interaction of a rotor blade with a tip vortex is studied. The time signature of this noise is calculated theoretically based on the measured blade surface pressure fluctuation of an operational load survey rotor in slow descending flight and is compared with the simultaneous microphone measurement. Particularly, the physical understanding of the characteristic features of a waveform is extensively studied in order to understand the generating mechanism and to identify the important parameters. The interaction trajectory of a tip vortex on an acoustic planform is shown to be a very important parameter for the impulsive shape of the noise. The unsteady nature of the pressure distribution at the very leading edge is also important to the pulse shape. The theoretical model using noncompact liner acoustics predicts the general shape of interaction impulse pretty well except for peak amplitude which requires more continuous information along the span at the leading edge.

Author

N81-33158*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ANALYSIS OF THE PERFORMANCE OF THE DRIVE SYSTEM AND DIFFUSER OF THE LANGLEY UNITARY PLAN WIND TUNNEL

Robert L. Stallings and Lowell E. Hasel Oct. 1981 67 p refs (NASA-TM-83168; L-14543) Avail: NTIS HC A04/MF A01 CSCL 01A

A broad program was initiated at the Langley Research Center in 1973 to reduce the energy consumption of the laboratory. As a part of this program, the performance characteristics of the Unitary Plan Wind Tunnel were reexamined to determine if potential methods for incresing the operating efficiencies of the tunnel could be formulated. The results of that study are summarized. The performance characteristics of the drive system components and the variable-geometry diffuser system of the tunnel are documented and analyzed. Several potential methods for reducing the energy requirements of the facility are discussed.

T.M.

N81-33159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STABILITY AND CONTROL CHARACTERISTICS OF A THREE-SURFACE ADVANCED FIGHTER CONFIGURATION AT ANGLES OF ATTACK UP TO 45 DEG

William P. Henderson and Laurence D. Leavitt Sep. 1981 47 p refs

(NASA-TM-83171; L-14433) Avail: NTIS HC A03/MF A01 CSCL 01A

The tests were conducted at Mach numbers from 0.40 to 0.90, at angles of attack up to 45 deg for the lower Mach numbers, and at angles of sideslip up to 15 deg. The model variations under study included adding a canard surface and deflecting horizontal tails, ailerons, and rudders.

T.M.

N81-33160*# Military Academy, West Point, N. Y.

EXPERIMENTAL AND THEORETICAL STUDY OF THREE INTERACTING, CLOSELY-SPACED, SHARP-EDGED 60 DEG DELTA WINGS AT LOW SPEEDS Final Report

H. F. Faery, Jr., J. K. Strozier, and J. A. Ham Washington NASA Oct. 1981 47 p refs Sponsored by NASA

(NASA-CR-3460) Avail: NTIS HC A03/MF A01 CSCL 01A

Wind tunnel tests were conducted to determine the subsonic longitudinal aerodynamic characteristics of lifting configuration consisting of a 60 deg delta main wing with two smaller 60 deg delta wings (called sub-wings) attached underneath. The test was designed to determine the effects on lift, drag, and pitching moment due to various placement of the subwings in relation to the main wing. Test results indicate the increasing vertical separation between the main wing and the sub-wings produced the most significant results; a 23.1% increase in maximum lift coefficient, a reduction in drag coefficient at high lift coefficients, and an increase in longitudinal stability. Lateral separation of the sub-wings produced no significant changes. Placement of the sub-wings rearward increases the initial lift curve slope and maximum lift coefficient and also increase the longitudinal stability. Results of a computer study using a vortex lattice code supported the experimental conclusions.

M.G.

N81-33161# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

INVESTIGATION OF UNSTEADY AIRLOADS ON WINGS WITH OSCILLATING CONTROL FOR ACTIVE CONTROL PURPOSES

W. Geissler (DFVLR, Goettingen, West Germany) Jul. 1981 16 p refs Presented at 52nd Meeting of the AGARD Structures and Mater. Panel, Cesme, Turkey, 5-10 Apr. 1981

(AGARD-R-699; ISBN-92-835-1392-2) Avail: NTIS HC A02/MF A01

Intensive experimental investigations were carried out on a wing section with oscillating control including a streamlined gap between both wing parts. Steady as well as unsteady pressure distributions were measured outside and inside the gap region for various incidences, flap angles, and frequencies. In addition to the experimental investigations, a calculation procedure was developed taking into account the real boundaries of the configuration including the gap region and assuming the fixed wing part and the oscillating control as two lifting systems with two Kutta conditions and correspondingly two wakes behind wing and control. Comparisons between theory and experiment are discussed in detail and the major influences and effects of viscosity are pointed out. The results lead to special conclusions for the applicability of lifting systems for active conrol purposes.

J.M.S.

N81-33162*# General Dynamics Corp., Fort Worth, Tex.

EVALUATION OF PRESSURE AND THERMAL DATA FROM A WIND TUNNEL TEST OF A LARGE-SCALE, POWERED, STOL FIGHTER MODEL Final Report, 4 Jun. 1980 - 4 Jun. 1981

G. A. Howell, E. L. Crosthwait, and M. C. Witte Jun. 1981 987 p refs

(Contract NAS2-10649)

(NASA-CR-166170) Avail: NTIS HC A99/MF A01 CSCL 01A

A STOL fighter model employing the vectored-engine-over wing concept was tested at low speeds in the NASA/Ames 40 by 80-foot wind tunnel. The model, approximately 0.75 scale of an operational fighter, was powered by two General Electric J-97 turbojet engines. Limited pressure and thermal instrumentation were provided to measure power effects (chordwise and spanwise blowing) and control-surface-deflection effects. An indepth study of the pressure and temperature data revealed many flow field features - the foremost being wing and canard leading-edge vortices. These vortices delineated regions of attached and separated flow, and their movements were often keys to an understanding of flow field changes caused by power and control-surface variations. Chordwise blowing increased wing lift and caused a modest aft shift in the center of pressure. The induced effects of chordwise blowing extended forward to the canard and significantly increased the canard lift when the surface was stalled. Spanwise blowing effectively enhanced the wing leading-edge vortex, thereby increasing lift and causing a forward shift in the center of pressure.

Author

N81-33163# ARO, Inc., Arnold Air Force Station, Tenn.

WIND TUNNEL TESTING OF A WINDSHIELD MATERIAL OR SUPERSONIC AIRCRAFT Final Report

D. W. Stallings (Calspan Field Services, Inc.) and A. S. Hartman

(Calspan Field Services, Inc.) AEDC May 1981 45 p refs Sponsored by AF
(AD-A103383; AEDC-TSR-81-V18) Avail: NTIS HC A03/MF A01 CSCL 01/3

Wind tunnel tests of windshield material intended for use on supersonic aircraft were conducted in the von Karman Facility Hypersonic Wind Tunnel B at a free-stream Mach number of 6 and tunnel stilling chamber conditions of 146 psia and 495 F. The wedge technique was used to provide a local Mach number of 2.5 over the windshield specimen. Selected results are presented to illustrate the test techniques and typical data obtained.
Author (GRA)

N81-33164# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
AERODYNAMICS: A TIME DEPENDENT FLOW MODEL FOR THE INNER REGION OF A TURBULENT BOUNDARY LAYER Final Report
Ho-Chen Chien and V. A. Sandborn Apr. 1981 144 p refs
(Contract N00014-80-C-0183; SR0230101)
(AD-A103353; CSU-CER80-81-HCC-VAS-45) Avail: NTIS HC A07/MF A01 CSCL 20/4

Response of the flow variables to external driving forces is non-linear for shear flows. For the turbulent boundary layer case, surface shear stress fluctuations of magnitude as great as the mean value are observed. For flow near the surface Prandtl's turbulent boundary layer approach of employing averaged Reynolds equation and a turbulence closure model is insufficient to account for surface shear fluctuations. A model which incorporates a discrete time dependent solution for the inner region of the turbulent boundary layer is proposed. The model requires stochastic averaging of the time dependent solution to account for the random aspect of the flow. The physical model for the flow near the surface is based on the bursting cycle observed in the inner region of a turbulent boundary layer. In order to confirm the time dependent model assumptions, measurements of the probability distribution and cross-correlation of the longitudinal turbulent velocity and the surface shear stress were evaluated. Results show that the mean value of surface shear and the large magnitude fluctuations of surface shear stress were reduced significantly. The variation in surface shear was found to be extremely sensitive to slight angle of attacks of the plates. GRA

N81-33165# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
AERODYNAMICS: CONTROL OF SURFACE SHEAR STRESS OF FLUCTUATIONS IN TURBULENT BOUNDARY LAYERS Final Report
V. A. Sandborn Apr. 1981 35 p refs
(Contract N00014-80-C-0183; SR0230101)
(AD-A103354; CSU-CER80-81-HCC-VAS-46) Avail: NTIS HC A03/MF A01 CSCL 20/4

An experimental study of techniques for modifying the surface shear stress, both mean and fluctuating, in turbulent boundary layers is reported. The surface shear along the test section of a 45.7cm square wind tunnel, with a downstream expansion section, was determined by means of surface-hot-wire-heat-transfer-gauges. Turbulent boundary layers in both zero and adverse pressure gradients were evaluated. The mean and fluctuating surface shear in a zero pressure gradient can be effectively reduced by employing a set of closely spaced fins. The fins protruded from the surface up through the sublayer. The fins produced an effective momentum defect for the boundary layer near the surface, which reduced the surface shear fluctuations by as much as 75 percent, two boundary layer thicknesses downstream, and 52 percent 15 boundary layer thicknesses downstream (the limit of the present experiment). The mean surface shear was also reduced by 35 to 25 percent for the same 2 to 15 boundary thicknesses downstream. The fins do not appear to produce a large increase in the thickness of the layer. No small size device, which could be mounted in the sublayer, was found that could develop a persistent increase in either the mean or fluctuating surface shear. Small scale vortex generators had no measureable effect on the flow for downstream distances greater than approximately 4 to 5 boundary layer thicknesses. Only the large scale vortex generator, normally use to delay boundary layer separation, produced an increase in surface shear at large distances downstream. Author (GRA)

N81-33166# Dayton Univ., Ohio. Fluid Mechanics Group.
ISOTHERMAL FLOWFIELD PREDICTIONS OF CONFINED COFLOWING TURBULENT JETS IN AN AXISYMMETRIC BLUFF BODY NEAR WAKE Final Technical Report, 1 Jan. - 30 Sep. 1980
L. Krishnamurthy Wright-Patterson AFB, Ohio AFWAL May 1981 67 p refs
(Contract F33615-77-C-2004; AF Proj. 2308)
(AD-A103639; UDR-TR-80-105; AFWAL-TR-81-2036) Avail: NTIS HC A04/MF A01 CSCL 20/4

Numerical computations are carried out to predict the turbulent flowfields under isothermal conditions in the Aero Propulsion Laboratory (APL) combustor. This combustor consists of an axially symmetrical configuration with a cylindrical bluff body placed inside a duct. Turbulent convection, diffusion and mixing of two coaxial jets - one flowing in the annulus between the duct and the bluff body and the other flowing through a central tube in the bluff body occur in the near-wake region of the bluff body. The ongoing APL experimental program involves both nonreacting and reacting situations, with air in the annular jet and with CO2 or air or propane (for combusting flows) in the central jet. The isothermal modeling predictions reported herein consider the influence of the annular and central flow rates and of the central-jet fluid on the nature of the flowfield downstream of the bluff body. The numerical computations are performed with the Field Relaxation Elliptic Procedure (FREP) Code. A constant effective eddy viscosity is employed in the calculations. The numerical results have demonstrated the complex nature of the flowfield interactions in the near-wake region under different flow rates in the annular and central jets. The character of the flowfield emerging from the numerical predictions when the near wake is dominated by the annular jet or the central jet is in conformity with the APL experimental observations and with the heuristic description suggested therefrom. GRA

N81-33167# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A FLOW MODEL FOR THE EFFECT OF A SLANTED BASE ON DRAG Final Report
Raymond Sedney Jul. 1981 30 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A104033; ARBRL-TR-02341) Avail: NTIS HC A03/MF A01 CSCL 20/14

Experiments by Morel have shown that slanting the base of a bluff body causes large variations in the drag, as the slant angle changes. For a particular, critical slant angle the drag changes discontinuously. This phenomenon was correlated with a drastic change in the type of base flow. A mechanism to explain this change, and therefore, the discontinuity in drag, is proposed. The basis of the mechanism is breakdown of the side edge vortices. An estimate of the swirl angle in these vortices is obtained using a swept-back mixing zone solution. This swirl angle and the other elements of the theory provide an estimate for the critical slant angle that is entirely consistent with the observed value. Author (GRA)

N81-33168# ARO, Inc., Arnold Air Force Station, Tenn.
TRANSONIC WING/STORE FLOW-FIELD MEASUREMENT USING A LASER VELOCIMETER Final Report, 8 Mar. 1979 - 30 Sep. 1980
F. L. Heltsley, F. L. Crosswy, and D. B. Brayton Aug. 1981 57 p refs
(AD-A103929; AEDC-TR-80-54) Avail: NTIS HC A04/MF A01 CSCL 01/3

A test was conducted in the Arnold Engineering Development Center (AEDC) Aerodynamic Wind Tunnel (1T) of the Propulsion Wind Tunnel Facility (PWT) to measure the flow fields about several wing/pylon/store configurations. Test models included a wall-mounted swept wing, five-percent MK-83 and M-117 stores, and swept and unswept pylons. Flow-field velocity measurements, made by using a three-component laser velocimeter, are presented. Author (GRA)

N81-33169# ARO, Inc., Arnold Air Force Station, Tenn.
AN INVESTIGATION OF STING INTERFERENCE EFFECTS

ON AN OSCILLATING CONE IN TRANSONIC FLOW Final Report, 26 Sep. - 30 Oct. 1979
Frederic B. Cyran Aug. 1981 88 p refs
(AD-A103959; AEDC-TR-80-66) Avail: NTIS HC A05/MF A01 CSCL 20/4

Wind tunnel sting support interference effects on dynamic stability derivatives, static pitching moment and base pressure of a blunt, 7-deg cone were investigated at subsonic and transonic Mach numbers. The cone was tested with sting configurations having a variable effective sting length ranging from 1 to 3.3 model base diameters, at angles of attack ranging from 0 to 30 deg. A forced-oscillation system was utilized to obtain data at a frequency of oscillation of approximately 5.3 Hz, and at an amplitude of 1 deg. The Reynolds number, based on model base diameter, was nominally 1.8 million, which produced a turbulent boundary layer over the aft portion of the model. The nature of the causes of these interference effects is discussed and analyzed with respect to sting length, type of measurement, and Mach number, with emphasis on defining critical sting length and on predicting minimal interference sting configurations for dynamic stability testing. The results showed that the critical sting length depended on the type of measurement used as the interference indicator, Mach number, and angle of attack. A critical sting length of three model diameters was determined to be suitable for all test conditions for the ratio of sting diameter-to-model base diameter (0.22) investigated. Author (GRA)

N81-33170# Naval Academy, Annapolis, Md. Dept. of Mechanical Engineering.
APPLICATION OF PANELING METHODS TO VORTEX-FIN INTERACTIONS Final Report, 16 Jun. - 15 Aug. 1981
Arthur R. Maddox 15 Aug. 1981 19 p refs
(WR02302003)
(AD-A013803; USNA-EW-6-81) Avail: NTIS HC A02/MF A01 CSCL 20/4

This work applies the Woodward USSAERO C code in a shortened form to the loads on an airfoil in the downwash field of a forward airfoil including the vortex impingement. The calculated pressure distributions are in general agreement with the experimental data, although both show the influence of the forward airfoil to be small in this case of a not-too-closely coupled line. The general trends of the loading on the rear fin both inboard and outboard of the vortex impingement are well demonstrated. The panel method can be used for this type of problem in aerodynamic loading. GRA

N81-33171# Sandia Labs., Albuquerque, N. Mex.
AERODYNAMIC SIZING OF VERTICAL-AXIS WIND TURBINES FOR WIND FARMS
James K. Cole Aug. 1981 30 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029294; SAND-81-0979) Avail: NTIS HC A03/MF A01

This study addresses the issue of whether a large number of small turbines or a small number of large turbines will generate the most total power on a given wind farm. The effects of atmospheric boundary layer, turbine pedestal height, and turbine Reynolds number are evaluated for vertical-axis wind turbines (VAWTs) that are 17, 46, and 85 m in diameter. Results indicate that for realistic thicknesses of atmospheric boundary layers, increasing the size of the turbine increases the total power generated. Adding a pedestal may also increase the power generated. If the atmospheric boundary layer exceeds 100 m in thickness, a wind farm can generate up to 73% more power through the use of 85-m-dia VAWTs instead of 17-m-dia VAWTs. DOE

N81-33172# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Unternehmensbereich Hamburger Flugzeugbau.
THE USE OF BODY FITTED COORDINATES IN CALCULATION METHODS FOR COMPRESSIBLE SUB AND TRANSONIC FLOWS Final Report
Juergens Clements Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 58 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-017; MBB-UA-16-79; ISSN-0179-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,20

A calculation method which solves the complete transonic potential flow equation is introduced. Body-fitted coordinates are applied as essential tools for the exact entrainment of edge conditions and for an economical distribution of grid points. This coordinate system is numerically built up by a finite difference scheme. The physical input is approximated by a difference scheme after being transformed into body-fitted coordinates. The difference scheme results as a generalization of the Jameson rotated scheme for the case of general curvilinear coordinates. Author (ESA)

N81-33130# Technische Universitaet, Munich (West Germany).
IDENTIFICATION OF NONLINEAR AERODYNAMIC EFFECTS FROM FLIGHT TEST MEASUREMENTS [IDENTIFIKATION NICHTLINEARER AERODYNAMISCHER EFFEKTE AUS FLUGVERSUCHSMESSUNGEN]
H. Schaeufle *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 69-101 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N81-33173# Directorate of Nuclear Safety, Kirtland AFB, N.Mex. Air Force Inspection and Safety Center.
SAFETY STUDY: PRIME NUCLEAR AIRLIFT FORCE (PNAF) MISSIONS INVOLVING THE USE OF C-130 AND C-141 AIRCRAFT Final Report
John G. Dean Jan. 1981 35 p refs
(AD-A103282; AFISC-TR-81-001) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report estimates the accident rate for C-130 and C-141 aircraft while involved in the air transportation of nuclear weapons as cargo. Causes and factors involved in accidents are shown, and beneficial practices are identified. Author (GRA)

N81-33174# Civil Aeromedical Inst., Oklahoma City, Okla.
IMPROVING THE CRASHWORTHINESS OF GENERAL AVIATION AIRCRAFT BY CRASH INJURY INVESTIGATIONS
William R. Kirkham May 1981 17 p refs Sponsored by FAA
(AD-A103316; FAA-AM-81-10) Avail: NTIS HC A02/MF A01 CSCL 01/2

An accident investigative research program has correlated injuries to aircraft occupants with the accident severity and structural changes in the crash. Findings brought to the attention of aircraft manufacturers have led to specific aircraft being made more crashworthy. Following the finding of a failure in a shoulder harness attachment the manufacturer strengthened the attachment brace. The way a shoulder harness was joined to a lapbelt was modified as a followup to failure of the attachment in an accident. Noted fractures of lapbelt and shoulder harness cable tiedowns led to the use of stronger cables and modification of the installation. Other accident findings resulted in a shoulder strap guide being placed on an inertia reel and a side-mounted seat being modified. GRA

N81-33175# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
EMERGENCY CABIN LIGHTING INSTALLATIONS: AN ANALYSIS OF CEILING- VERSUS LOWER CABIN-MOUNTED LIGHTING DURING EVACUATION TRIALS
Burton P. Chesterfield, Paul G. Rasmussen, and Robert D. Dillon Feb. 1981 46 p refs
(AD-A103191; FAA-AM-81-7) Avail: NTIS HC A03/MF A01 CSCL 01/2

Six series of human subject evacuation tests were conducted to compare the evacuation rates with two different emergency lighting systems in an aircraft cabin filled with nontoxic white smoke. Cabin emergency lighting and exit signs mounted near the ceiling were almost completely obscured by smoke, which layered most heavily in the upper one-half of the cabin. A comparison lighting system mounted below layered smoke in aisle seat armrests, with exit signs mounted at and below the cabin midpoint, provided light directly in the aisle and cross aisle. Results indicated that lights and signs mounted lower in the cabin were more readily visible in smoke and enabled subjects to evacuate from a smoke-filled cabin more rapidly than conventional ceiling-mounted lights and signs. Author (GRA)

N81-33176# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.

TEST AND EVALUATION OF COMMERCIALLY AVAILABLE HALON 1211 HAND-PORTABLE FIRE EXTINGUISHERS FOR USE IN HABITABLE AND CARGO COMPARTMENTS OF ILSAF AIRCRAFT Final Report, Aug. 1980 - Feb. 1981

Joseph L. Walker, Richard N. Vickers, and Anthony J. Kwan May 1981 109 p refs
(AF Proj. 2505)
(AD-A103907; AFESC/ESL-TR-81-22) Avail: NTIS HC A06/MF A01 CSCL 01/2

This report describes the results of a test and evaluation program of commercially available, off-the-shelf Halon 1211 hand-portable fire extinguishers. The primary emphasis of the test program was aimed at establishing the flightworthiness/crashworthiness characteristics of candidate articles. Tests were also conducted to evaluate the test item's design features, function, operational capabilities and maintainability. Results of this test program will be used in establishing procurement specifications for Halon 1211 first-aid hand-portable fire extinguishers for use on board USAF aircraft. Author (GRA)

N81-33177# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

TEST AND EVALUATION OF AN EXPERIMENTAL FEASIBILITY PROTOTYPE PASSIVE SEAT MOUNTED LIMB RESTRAINT SYSTEM

Marcus Schwartz 20 May 1981 63 p
(AD-A104161; NADC-81065-60) Avail: NTIS HC A04/MF A01 CSCL 13/6

An experimental feasibility prototype of passive seat mounted limb restraint system was tested under various conditions both statically and dynamically on the NAVAIRDEVCEN Ejection Tower and the Dayton T. Brown windblast facility. The Ejection Tower tests resulted in successful and repeatable entrapment of the arm and legs, and good tensioning of the restraint lines through one-way snubbers. The windblast test series also resulted in successful entrapment of the limbs at various pitch and yaw angles up to 600 knots. The results of this T&E study clearly showed the feasibility of the system to provide the necessary protection to the crewmember during the simulated operation environments, and also to meet the passive requirements which results in no additional encumbrances on the crewmember.
Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N81-33178# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavelning 3.

POSITION ERRORS FROM HYDROACOUSTICS NAVIGATION [POSITIONSFEL VID HYDROAKUSTISK NAVIGERING]

Lars Goetherstroem Apr. 1980 57 p refs In SWEDISH
(FOA-C-30186-E3) Avail: NTIS HC A04/MF A01

Navigation errors related to the propagation of hydroacoustic waves and their anomalies are considered. The effects of perturbations and noises are analyzed. Estimations of quadratic distance and angle errors in function of a series of parameters, such as signal to perturbation relation, width of filter passband, pulse duration, detection characteristics, wavelength, geometric dimensions of the hydrophone array, and distance separating emitter from receptor, are presented. The order of magnitude of the different types of position error was examined. Measures for limiting these errors are proposed. Author (ESA)

N81-33179# Arinc Research Corp., Annapolis, Md.

EVALUATION OF VARIOUS NAVIGATION SYSTEM CONCEPTS Interim Report

L. Hogle and S. Toth Jul. 1981 121 p refs
(Contract DT-FA01-80-C-10030)
(AD-A103243; Rept-1378-01-TR-2497; FAA-EM-81-6) Avail: NTIS HC A06/MF A01 CSCL 17/7

The purpose of this study is to identify the capabilities and limitations of a particular set of navigation systems and evaluate their performance in the current airspace environment. The navigation systems evaluated are Loran-C, Omega, VHF Omnidirectional Range/Distance Measuring Equipment (VOR/DME), and Global Positioning System (GPS). In addition to detailed technical and operational analyses of each navigation system, consideration is also given to the constraints imposed by and the deficiencies existing in the standards by which accuracy and effectiveness of navigation systems are measured.
Author (GRA)

N81-33180# Army Engineer Topographic Labs., Fort Belvoir, Va.

TECHNIQUES FOR THE IMPROVEMENT OF ASTRONOMIC POSITIONING IN THE FIELD

Angel A. Baldini 27 Feb. 1981 54 p refs Presented at the ASP-ACSM Conv., Washington, D.C., 23-27 Feb. 1981
(AD-A103390; ETL-R024) Avail: NTIS HC A03/MF A01 CSCL 17/7

This paper deals with new methods and techniques for improving astronomic positioning in the field. Latitude and longitude are obtained by observing transit times of pairs of stars over a fixed vertical plane, independent of azimuth and zenith distances. A unique solution is derived for each pair. Therefore, short periods of clear skies can be utilized. The time and therefore cost to establish one station is accordingly reduced. Higher accuracy in latitude can be obtained by observing transit times of star pairs over the prime vertical, where the parallactic angle reaches its maximum value. The vertical plane of observation can be fixed within 90 arc seconds with respect to the prime vertical without changes in the star's parallactic angle, and a function of it, the latitude, can then be computed. The star transit times over different vertical lines are thereby reduced to the central line or collimation plane, as a function of the parallactic angle. Higher accuracy in longitude can be achieved by observing the transit times of pairs of stars over a vertical plane fixed within 20 arc minutes with respect to the meridian plane. Each individual star pair will determine a solution. Since each pair does not depend on azimuth orientation, the star pairs can be chosen arbitrarily with respect to declination or zenith distance, and short periods of clear sky observations can be utilized. When several pairs are observed an adjustment can be carried out through the equations of condition that allow one to detect errors in either the transit times or in the star's right ascensions. Author (GRA)

N81-33181# Federal Aviation Administration, Atlantic City, N.J. Technical Center.

MULTISITE TESTING OF THE DISCRETE ADDRESS BEACON SYSTEM (DABS) Interim Report, Mar. - Sep. 1980

J. L. McMillen, J. W. Davis, and R. J. Spadea, Jr. Jul. 1981 61 p refs
(FAA Proj. 034-241-510)
(AD-A103575; FAA-CT-81-9; FAA-RD-81-49) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report contains results of tests performed in an environment of multiple Discrete Address Beacon System (DABS)

sensors, one each located at Clementon and Elwood, New Jersey, and the Federal Aviation Administration (FAA) Technical Center, Atlantic City Airport, New Jersey. These DABS sensors were tested in various degrees of intersensor communication that ranged from a full network of connected sensors to a fully nonnetted configuration. The multiple DABS sensors were tested in four major areas: network management, surveillance processing, data link processing, and intersensor communications. It is concluded that the performance of the DABS sensors in multisite configurations meets or exceeds the requirements specified in the DABS engineering requirement (FAA-ER-240-26). Author (GRA)

N81-33182# Federal Aviation Administration, Atlantic City, N.J.
CROSSTALK LEVELS OF SPEECH PLUS DATA IN REMOTE COMMUNICATION AIR-GROUND (RCAG) Final Report, Aug. 1979 - May 1980
Albert J. Rehmann Jun. 1981 61 p refs
(AD-A103351; FAA-CT-80-38) Avail: NTIS HC A04/MF A01 CSCL 17/2

The Federal Aviation Administration (FAA) is proposing the addition of a digital data channel to the existing telephone lines which connect air route traffic control centers (ARTCC's) with Remote Communication Air-Ground (RCAG) sites to economically transfer remote monitoring system (RMS) parameters and control data between the ARTCC's and the sites. FAA Specification FAA-E-2699a establishes the maximum allowable interference level to pilot/controller communications which would be allowed to result from the addition of the data channel. The tests described in this document were designed to verify that the requirements in FAA-E-2699a are sufficient to prevent disturbance to normal air traffic control (ATC) operations. The tests were performed by simulating and existing communications channel using data modems and samples of present-day Voice Frequency Control System (VFCS) equipment. Crosstalk levels of speech and data were measured under actual operating conditions. The test results indicated that the addition of an RMS data channel to existing FAA telephone lines is technically feasible and that the requirement in FAA-E-2699a concerning the data crosstalk in the audio portion of the communication channel is not adequate to prevent disturbance to normal ATC operations. The requirements concerning data crosstalk in the control portion and VFCS crosstalk in the data portion of the channel are sufficient.
Author (GRA)

N81-33183# Federal Aviation Administration, Atlantic City, N.J.
EN ROUTE DISCRETE ADDRESS BEACON SYSTEM/AIR TRAFFIC CONTROL (BUILD 1) TECHNICAL TESTING
Robert E. Copes, III and Richard V. Dardano Jul. 1981 35 p
(FAA Proj. 122-115-540)
(AD-A103894; FAA-CT-80-30; FAA-RD-81-31) Avail: NTIS HC A03/MF A01 CSCL 17/7

Tests of the Discrete Address Beacon System (DABS) in an air traffic control (ATC) en route National Airspace System (NAS) environment were conducted at the Federal Aviation Administration (FAA) Technical Center. These tests included: (1) surveillance performance in the areas of track initiation, track continuity, and track swap; and (2) surveillance related communication responses employing the Common International Civil Aviation Organization (ICAO) Data Interchange Network (CIDIN) protocol for Air Traffic Control Radar Beacon System (ATCRBS) identification (ID) requests. Test results indicate that the en route DABS/ATC Build I software successfully processed DABS sensor surveillance information. Although analyzed on a limited basis, the transmission of surveillance related communication messages between the DABS sensor and the en route DABs/ATC Build I system is considered to operate as expected. It is concluded that the DABS/ATC en route Build I system accepts, processes, tracks, and displays DABS and ATCRBS surveillance data from one DABS and multiple ATCRBS sensors with no degradation to the baseline function of the NAS software system A3d2.4.
Author (GRA)

N81-33184# Federal Aviation Administration, Washington, D.C. Air Traffic Service.
OPERATION FREE FLIGHT: AN OPERATIONAL EVALUATION OF DIRECT ROUTE FLIGHT PLAN FILING IN TODAY'S NATIONAL AEROSPACE SYSTEM Final Report
Wayne Minnick Jul. 1981 87 p
(AD-A104150; FAA-AT-81-1) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report presents the results of an operational evaluation concerning the feasibility of permitting the filing of direct route flight plans, without route definition, between departure and arrival area fixes serving selected city-pairs. The evaluation was conducted with the voluntary participation of Eastern, United, and Pan American Airlines during the period June 1 through December 31, 1980. Objectives of Operation Free Flight were to obtain factual information about air traffic control (ATC) handling of test aircraft on direct routings, system prohibitions to the concept, general pilot attitude regarding the utility of their RNAV equipment, potential fuel savings, and ATC system impact. The evaluation was conducted throughout the contiguous United States between 27 city-pairs. The primary conclusions were: the operational concept of filing direct, great circle routes between departure and arrival area fixes, at altitudes above Flight Level 290, in a radar environment; incompatibility with traffic arrival flow at destination airports was determined to be the most significant system prohibition; pilot attitude was skewed in a positive direction; potential fuel savings are projected to be in excess of 40,000,000 gallons per year, and, there was no adverse impact to the ATC system. Author (GRA)

N81-33185# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF THE NAVSTAR/GLOBAL POSITIONING SYSTEM ON INSTRUMENTED RANGES M.S. Thesis
William L. Reinhart Mar. 1981 188 p refs
(AD-A104069) Avail: NTIS HC A09/MF A01 CSCL 17/7

This report treats the application of the NAVSTAR/Global Positioning System as the Position/Location System in Real Time Casualty Assessment experiments. The desirable characteristics of a position/location system are listed. A current position/location system, the Range Measuring System, is used as a comparison reference for the Global Positioning System. Operation and parameters of the Global Positioning System are presented. A description and the results of a five day demonstration conducted on an instrumented range using a Global Positioning System prototype receiver are given. It is concluded that the Global Positioning System has some important advantages and that more study and further tests are needed to determine the full extent of its potential. Author (GRA)

N81-33186# Mitre Corp., McLean, Va.
AUTOMATIC TRAFFIC ADVISORY AND RESOLUTION SERVICE (ATARS) ALGORITHMS INCLUDING RESOLUTION-ADVISORY-REGISTER LOGIC. VOLUME 1: SECTIONS 1 THROUGH 11
R. H. Lentz, W. D. Love, T. L. Signore, R. A. Tornese, and A. D. Zeitlin Washington FAA Jun. 1981 459 p refs 2 Vol.
(Contract DOT-FA80WA-4370)
(AD-A104147; MTR-81W120-1; FAA-RD-81-45-1) Avail: NTIS HC A20/MF A01 CSCL 17/7

This document presents detailed computer algorithms for programming the Automatic Traffic Advisory and Resolution Service (ATARS). A major feature of this version of the ATARS algorithms is the capability to exchange resolution advisory information via the airborne Resolution Advisory Register (RAR). This provides for coordination of resolution advisories between ATARS and airborne collision avoidance systems and between adjacent ATARS sites in the absence of ground communication lines. The ground based ATARS computers use the surveillance data from the Discrete Address Beacon System (DABS) to provide properly equipped aircraft with traffic advisories and collision resolution advisories. These advisories are discretely delivered to the aircraft via the DABS data link. The ATARS algorithms are presented in two volumes rather than one large document in order to provide the algorithms in a more manageable form.
GRA

N81-33187# Mitre Corp., McLean, Va.
AUTOMATIC TRAFFIC ADVISORY AND RESOLUTION SERVICE (ATARS) ALGORITHMS INCLUDING RESOLUTION-ADVISORY-REGISTER LOGIC. VOLUME 2: SECTIONS 12 THROUGH 19, APPENDICES
R. H. Lentz, W. D. Love, T. L. Signore, R. A. Tornese, and A. D. Zeitlin Washington FAA Jun. 1981 602 p refs 2 Vol.
(Contract DOT-FA80WA-4370)

(AD-A104148; MTR-81W120-2; FAA-RD-81-45-2) Avail: NTIS HC A99/MF A01 CSCL 17/7

The ground based ATARS computers use the surveillance data from the Discrete Address Beacon System (DABS) to provide properly equipped aircraft with traffic advisories and collision resolution advisories. These advisories are discretely delivered to the aircraft via the DABS data link. The ATARS algorithms are presented. A major feature of this version of the ATARS algorithms is the capability to exchange resolution advisory information via the airborne Resolution Advisory Register (RAR) T.M.

N81-33188# Transportation Research Board, Washington, D.C.
COMPUTER GRAPHICS APPLICATIONS
Michael R. Couture, Jerome M. Lutin, Dale Livingston, Edward J. Kobialka, and Neil W. Polhemus 1980 42 p refs
(PB81-215246; TRB/TRR-787; ISBN-0-309-03201-6; LC-81-9570; ISSN-0361-1981) Avail: NTIS HC A03/MF A01 CSCL 17G

Issues in computer graphics application are reported. The following areas are discussed: (1) computer graphics for transit planning, an empirical study, (2) interactive graphics model for testing stochastic traffic assignment algorithms, (3) use of computer graphics to analyze navigational performance and jet route separation, (4) applications of interactive graphics in Michigan's statewide transportation modeling system. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-33189*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A PROGRAMING SYSTEM FOR RESEARCH AND APPLICATIONS IN STRUCTURAL OPTIMIZATION
Jaroslaw Sobieszczanski-Sobieski and James L. Rogers, Jr. Aug. 1981 15 p refs
(NASA-TM-83191) Avail: NTIS HC A02/MF A01 CSCL 01C

The flexibility necessary for such diverse utilizations is achieved by combining, in a modular manner, a state-of-the-art optimization program, a production level structural analysis program, and user supplied and problem dependent interface programs. Standard utility capabilities in modern computer operating systems are used to integrate these programs. This approach results in flexibility of the optimization procedure organization and versatility in the formulation of constraints and design variables. Features shown in numerical examples include: variability of structural layout and overall shape geometry, static strength and stiffness constraints, local buckling failure, and vibration constraints. T.M.

N81-33190*# Beech Aircraft Corp., Wichita, Kans.
APPLICATION OF ADVANCED TECHNOLOGIES TO DERIVATIVES OF CURRENT SMALL TRANSPORT AIRCRAFT Final Report
P. P. Renze and J. E. Terry Jul. 1981 112 p refs
(Contract NAS2-10571)
(NASA-CR-166197) Avail: NTIS HC A06/MF A01 CSCL 01C

Mission requirements of the derivative design were the same as the baseline to readily identify the advanced technology benefits achieved. Advanced technologies investigated were in the areas of propulsion, structures and aerodynamics and a direct operating cost benefit analysis conducted to identify the most promising. Engine improvements appear most promising and combined with propeller, airfoil, surface coating and composite advanced technologies give a 21-25 percent DOC savings. A 17 percent higher acquisition cost is offset by a 34 percent savings in fuel used. T.M.

N81-33191*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
STATISTICS OF SOME ATMOSPHERIC TURBULENCE RECORDS RELEVANT TO AIRCRAFT RESPONSE CALCULATIONS
William D. Mark and Raymond W. Fischer Washington NASA Sep. 1981 238 p refs
(Contract NAS1-14837)
(NASA-CR-3464) Avail: NTIS HC A11/MF A01 CSCL 01C

Methods for characterizing atmospheric turbulence are described. The methods illustrated include maximum likelihood estimation of the integral scale and intensity of records obeying the von Karman transverse power spectral form, constrained least-squares estimation of the parameters of a parametric representation of autocorrelation functions, estimation of the power spectra density of the instantaneous variance of a record with temporally fluctuating variance, and estimation of the probability density functions of various turbulence components. Descriptions of the computer programs used in the computations are given, and a full listing of these programs is included. T.M.

N81-33192# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
ANALYSIS AND DESIGN OF SUPERSONIC AIRCRAFT BASED ON INVISCID NONLINEAR EULERIAN EQUATIONS. PART 1: ROTATIONAL EULER SOLUTIONS WITH EXPLICIT SHOCK FITTING Final Report, 1 Oct. 1977 - 1 Apr. 1979
M. J. Siclari and F. Marconi Oct. 1980 118 p refs
(Contract F33615-77-C-3126; AF Proj. 2404)
(AD-A103434; RE-623-Pt-1; AFWAL-TR-80-3110-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 01/3

A computer program has been developed to compute the inviscid supersonic flow over delta wings and smooth wing-body configurations. A second-order accurate predictor-corrector finite-difference scheme is used to integrate the three dimensional Euler equations in regions of continuous flow. Bow shock and crossflow-induced embedded shocks are explicitly computed as discontinuities which simultaneously satisfy the characteristic and the Rankine-Hugoniot conditions. In computing the flow about complex wing cross sections, the use of appropriate conformal mappings was an important factor in developing a computational mesh capable of resolving the large flow gradients that are inevitable in the vicinity of wing leading edges. Geometry programs were developed to supply the appropriate geometric boundary conditions necessary to compute complex wing cross sections. New starting solutions were developed that were more appropriate to thin-wing cross sections. In the initial stage of development, the flow about conical wings was computed for a two-fold purpose. Conical Euler solutions would be used as starting conditions for conical wing-bodies and three dimensional wings and the conical problem would uncover potential problem areas in the computation of these flows without the added complexity of geometrical variations. The conical problem led to the development of special techniques to resolve the vortical layer that inevitably develops on the body surface. Typical results are shown for subsonic and supersonic leading edge delta wings and wing-body combinations. GRA

N81-33193# Simula, Inc., Tempe, Ariz.
DESIGN AND DEVELOPMENT OF VARIABLE-LOAD ENERGY ABSORBERS Final Report, Jul. 1979 - Jun. 1981
Craig M. Svoboda and James C. Warrick 16 Jun. 1981 58 p
(Contract N62269-79-C-0241; WF41451403)
(AD-A103206; TR-8023; NADC-80257-60) Avail: NTIS HC A04/MF A01 CSCL 01/3

The objectives of this program were to analyze, design, and test variable-load energy absorber concepts. Such energy absorbers make it possible for the limit load of an energy absorbing seat to correspond to the occupant's weight, thus providing optimum crash protection within a given fixed stroking distance. A prime consideration was retrofitability of the variable-load energy absorbers to seats now equipped with fixed-load energy absorbers. Three concepts were developed and/or tested: a wire-bending mechanism, a tube-constricting mechanism, and a hydraulic energy absorber. Preliminary full-scale working models of the wire-bending mechanism and the tube-constricting mechanisms were built and tested. The hydraulic energy absorber was evaluated by a computer simulation. Different adjustment and control concepts were also evaluated. The tube-constricting mechanism was found to offer the best combination of features and was therefore selected for further prototype development.

The prototype variable-load energy absorber utilized an inversion tube process to supply a fixed load sized for the lightest occupant. Additional variable load was supplied for heavier occupants by the tube-constricting mechanism which further deformed the inverted tube. Energy absorbers of this type, together with a remote control selector dial coupled to the energy absorbers by flexible shafts, were installed on an SH-60B crewseat for evaluation in a series of dynamic tests. Author (GRA)

N81-33194# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
DESIGN OF A SLOT HEIGHT DISTRIBUTION FOR INCREASED HOVER CONTROL POWER ON A CIRCULATION CONTROL ROTOR Final Report
Daniel W. Poe Dec. 1980 31 p refs
(AD-A103535; DTNSRDC/ASED-80/24) Avail: NTIS HC A03/MF A01 CSCL 01/3

The Circulation Control Rotor Performance Prediction computer program was used with the XH-2/CCR rotor configuration to determine a slot height distribution that would improve control power in hover without causing excessive cyclic pressure requirements for trim in forward flight. Effects of total slot area as well as distribution were considered. The final distribution was constrained by a minimum practical slot height setting of 0.002 in. and a minimum unpressurized blade slot area of 3.0 square inches. Several distributions were evaluated. Noteworthy trends that emerged are: (1) A negatively tapered slot height distribution is favorable to producing hub moments in hover, and (2) a uniform distribution (zero taper) requires the lowest cyclic pressure for trim at 120 knots. The final distribution selection exhibited a 38-percent improvement in predicted hub moment over a slot height distribution previously used on the flight demonstrator. Author (GRA)

N81-33195# Tennessee Univ. Space Inst., Tullahoma.
A FLIGHT TEST EVALUATION OF THE BALL-BARTOE JETWING PROPULSIVE LIFT CONCEPT Progress Report, 18 Apr. 1980 - 17 Apr. 1981
Ralph D. Kimber 1 Jul. 1981 191 p refs
(Contract N00019-80-C-0126)
(AD-A103579; UTSI-81-1) Avail: NTIS HC A09/MF A01 CSCL 01/3

The need for military aircraft that will operate from short unimproved airfields, and the decks of smaller aircraft carriers has increased in recent years due to a changing world situation and the shrinking of the dollar. Such aircraft need to be fuel efficient, quiet, maneuverable, have low infrared signature, and carry a large useful load. The Ball-Bartoe 'Jetwing' is a single engine upper surface blowing concept which offers the possibility of achieving these objectives. The 'Jetwing' concept achieves supercirculation lift and STOL performance by ducting all engine air through the leading edge of the wing and ejecting it over the top surface of the wing through a slot nozzle. This nozzle extends along approximately 70% of the wing span. A Coanda flap is mounted at the trailing edge of the blown portion of the wing. In addition to the main wing, a smaller wing panel is mounted above the slot nozzle. The air passage between the main wing and the smaller upper wing acts as an ejector to reduce installed thrust losses. For high speed applications that concept may be used without this upper wing. A thrust reversing method is also incorporated into the concept. The thrust is reversed by rotating the top of the slot nozzle so as to close the nozzle and open a reverse flow path. This report covers the flight test program of the Jetwing research airplane. GRA

N81-33196# Dayton Univ., Ohio. Research Inst.
ALTERNATE T-38 TRANSPARENCY DEVELOPMENT. PART 1: INITIAL ANALYSIS AND DESIGN Final Report, Jan. 1979 - Sep. 1980
Blaine S. West and Kenneth I. Clayton Wright-Patterson AFB, Ohio AFWAL Nov. 1980 58 p refs 2 Vol.
(Contracts F33615-76-C-3103; F33615-80-C-3401; AF Proj. 2202; AF Proj. 1926)
(AD-A103261; UDR-TR-80-91-Pt-1; AFWAL-TR-80-3132-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 01/3

T-38 missions at speeds above the existing crew enclosure damage threshold will result in flight safety risk to aircraft and crew. This report documents the design development of alternate T-38 transparencies having the capability of defeating the impact of a four pound bird at aircraft speeds up to 400 knots. To accomplish the desired windshield/canopy redesign, a feasibility study was conducted, damage probability was determined, the birdstrike capability of existing transparencies was experimentally evaluated, edge attachment screening specimens were laboratory tested, and finite element analyses were made. Major findings from each task have been integrated into the detail design of a birdstrike resistant forward windshield panel, recommended for full-scale hardware fabrication, testing, and evaluation. Forward canopy and instructor windshield concepts are also discussed. Author (GRA)

N81-33197# Dayton Univ., Ohio. Research Inst.
ALTERNATE T-38 TRANSPARENCY DEVELOPMENT. PART 2: BASELINE BIRDSTRIKE TESTING Final Report, Jun. 1979 - Oct. 1980
Blaine S. West Wright-Patterson AFB, Ohio AFWAL Dec. 1980 92 p 2 Vol.
(Contracts F33615-76-C-3103; F33615-80-C-3401; AF Proj. 2202; AF Proj. 1962)
(AD-A103262; UDR-TR-80-61-Pt-2; AFWAL-TR-80-3132-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 01/3

T-38 missions at speeds above the existing crew enclosure damage threshold will result in flight safety risk to aircraft. This report documents the results of a full-scale flight hardware test program to establish the bird impact resistance of existing T-38 forward transparencies. The failure threshold for the forward windshield and forward canopy for a four-pound birdstrike at six impact locations was established. Test results are reported and discussed in detail. Author (GRA)

N81-33198# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
ENGINE ACOUSTIC IMPEDANCE MODELED AS A CYCLIC SERIES OF PASSIVE SYSTEM IMPEDANCES Final Report, Jan. 1978 - Feb. 1980
Thomas J. Lagnese, Jr. Jul. 1981 134 p refs
(AF Proj. 2307)
(AD-A103931; AFWAL-TR-80-4203) Avail: NTIS HC A07/MF A01 CSCL 21/7

The objective of this project was to utilize a recently proposed two sensor sampling technique for attaining certain acoustic properties of an internal combustion engine. Particular interest will be in attempting to define the acoustic source impedance characteristics of an internal combustion engine. The two sensor method of analysis incorporates a Digital Signal Analyzer system to analyze the sensor signals and to calculate incident-reflected acoustic properties. The laboratory method of experimentation includes exposure of the engine to a broadband random noise while performing signal analysis using a transfer function technique. The acoustic source impedance results obtained from this analysis for the engine are then interpreted within a format of passive acoustic systems. It was a hypothesis of this experimentation that the operating engine can be modeled as a series of cyclic passive systems. This hypothesis has been assessed from experimental results obtained from impedance studies of the motored and powered engine. Modeling of the engine as a cyclic series of passive systems was found to be quite useful for interpreting experimental acoustic impedances for motored engines. This acoustic engine model was found to be less applicable for powered engine studies. Author (GRA)

N81-33199# Calspan Corp., Buffalo, N. Y.
AN EXPERIMENTAL INVESTIGATION OF VTOL FLYING QUALITIES REQUIREMENTS OR SHIPBOARD LANDINGS Final Report, Apr. 1978 - Sep. 1980
Robert C. Radford, Dominick Andrisani, II, and John L. Bellman Aug. 1981 262 p refs
(Contract N62269-78-C-0043)
(AD-A104137; CALSPAN-6286-F-1; NADC-77318-60) Avail: NTIS HC A12/MF A01 CSCL 01/2

This fifth simulation experiment, using the U.S. Navy X-22A variable stability V/STOL aircraft, was undertaken to generate data for the development to flying qualities and advanced flight control system design criteria for the visual shipboard landing task. Since a broad range of flying qualities was simulated, actual landings were not performed because of flight safety considera-

tions. Instead, a discrete three dimensional position tracking task, presented to the pilot on a Head-Up-Display (HUD), was devised to evoke pilot control and stabilization activity similar to that in the actual shipboard environment. A microwave landing system with precision ranging capability served as the guidance sensor for both the translational rate flight control system mechanizations and for the HUD tracking information. A total of 3 evaluations were performed of various horizontal and vertical translational rate flight control system dynamics. The primary results of the program defined regions of satisfactory and acceptable flying qualities as functions of velocity command gain and the time constant of velocity response. The limits on command gain and time constant for satisfactory flying qualities indicated by this experiment are considerably smaller than those determined in ground simulator experiments. Author (GRA)

N81-33200# Sandia Labs., Albuquerque, N. Mex. Div. 1556.
ADVANCED COMPOSITE AIRCRAFT ELECTROMAGNETIC DESIGN AND SYNTHESIS
R. F. Wallenberg (Syracuse Research Corp., N.Y.), J. A. Birken (Naval Air System Command, Washington, D.C.), and O. Milton Apr. 1981 9 p refs Presented at the IEEE Intern. Symp. on Electromagnetic Compatability Record, Boulder, Colo., 18-20 Aug. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1278C; CONF-810816-1; SRC-TR-81-1170) Avail: NTIS HC A02/MF A01

The ramifications of using advanced composite materials in more upcoming aircraft were investigated. Mission requirements include fly by wire systems surviving increased threats when contained in a composite material fuselage which generally provides poor electromagnetic shielding. The coupling of lightning and a nuclear electromagnetic pulse to aircraft comprised of composite materials are addressed. DOE

N81-33201# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
RESPONSES TO COMMENTS OF AIR TRANSPORT ASSOCIATION OF AMERICA ON AIRCRAFT TOWING FEASIBILITY STUDY
Jun. 1981 112 p refs
(Contract DE-AC01-79CS-50069)
(DE81-029834; DOE/CS-50069/T1) Avail: NTIS HC A06/MF A01

A preliminary assessment of the constraints on and feasibility of extended aircraft towing between airport runways and terminal gate areas with engines shutdown is made. Past aircraft towing experience and the state of the art in towing equipment are reviewed. Safety and operational concerns associated with aircraft towing are identified, and the benefits and costs of implementing aircraft towing at 20 major US airports are analyzed. It was concluded that extended aircraft towing is technically feasible and that substantial reductions in aircraft fuel consumption and air pollutant emissions can be achieved through its implementation. It was also concluded that, although capital and operating costs associated with towing would be increased, net savings could generally be attained at these airports. Because of the lack of past experience and the necessity of proving the cost effectiveness of towing concept, a demonstration of the feasibility of large scale aircraft towing is necessary. DOE

N81-33202# Intermountain Forest and Range Experiment Station, Ogden, Utah.
DETERMINING AIRTANKER DELIVERY PERFORMANCE USING A SIMPLE SLIDE CHART-RETARDANT COVERAGE COMPUTER
Charles W. George Apr. 1981 12 p refs
(PB81-218083; FSGTR/INT-113) Avail: NTIS HC A02/MF A01 CSCL 01C

Slide chart computers were developed to guide application of fire retardant airtankers. The computers predict delivery performance for tank and gating systems on specific aircraft and recommend coverage levels for various fuel and fire situations. The devices also enable personnel to calculate safe drop heights, length of retardant line, and most effective drop configuration. The computers cover both gunlike and waterlike retardants and are available for many aircraft and tank and gating systems in operation. GRA

N81-33148# Institut fuer Flugmechanik, Brunswick (West Germany).
THE IMPACT OF HELICOPTER FLIGHT MECHANICS ON MISSION PERFORMANCE
B. L. Gmelin and H.-J. Pausder *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 14 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

N81-33150# Textron Bell Helicopter, Fort Worth, Tex. Tilt Rotors.
MISSION POTENTIAL OF DERIVATIVES OF THE XV-15 TILT ROTOR RESEARCH AIRCRAFT
Kenneth G. Wernicke *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 9 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

N81-33151# Sikorsky Aircraft, Stratford, Conn.
ADVANCING BLADE CONCEPT HELICOPTER MISSION CAPABILITIES
Robert Zincone and Arthur W. Linden *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 16 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

N81-33155# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE IMPACT OF OPERATIONAL REQUIREMENTS ON THE COMPROMISE OF DESIRED FEATURES IN ROTORCRAFT DESIGN
Klaus F. M. Schymanietz *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 17 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

N81-33131# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
DESIGN OF OPTIMAL INPUTS FOR THE IDENTIFICATION OF CHARACTERISTICS OF AIRCRAFT FLIGHTS [ENTWURF VON EINGANGSSSIGNALEN FUER DIE KENNWERTERMITTLUNG BEI FLUGZEUGEN]
E. Plaetschke *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 102-120 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

N81-33132# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
SYSTEM IDENTIFICATION FOR CONTROLLED AIRCRAFT [SYSTEMIDENTIFIZIERUNG AM GEREGELTEN FLUGZEUG]
M. Marchand *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 121-166 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N81-33203*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR EVALUATION OF SEPARATION OF DISPLAY PARAMETERS IN PATH-FOLLOWING TASKS
Garimella R. Sarma and James J. Adams Oct. 1981 44 p refs
(NASA-TP-1915; L-14590) Avail: NTIS HC A03/MF A01 CSCL 01D

A five degree of freedom, fixed base simulation changing

the location of the displays for bank angle, pitch angle, heading angle, and the vertical and lateral displacement from an instrument landing system path was studied. It is shown that the accuracy of the lateral path following and the pilot aircraft system dynamic characteristics deteriorate when bank angle is displayed separated from the other attitudes. It is found that best results are obtained when bank, heading, and pitch angles are displayed together and vertical and lateral displacements are displayed at another location in the display. E.A.K.

N81-33204# Aircraft Research and Development Unit, Edinburg (Australia).
DEVELOPMENT OF AN INSTRUMENT FOR THE ACCURATE MEASUREMENT OF AIRCRAFT AIRSPEED AND ALTITUDE
G. G. Readett Jul. 1981 28 p refs
(AD-A103421; ARDU-TI-466) Avail: NTIS HC A03/MF A01 CSCL 01/4

Aircraft Research and Development Unit has developed a trailing pitot-static probe suitable for determining pressure error corrections for aircraft airspeed and altitude systems. The instrument is suitable for use with helicopters where both pitot and static pressure measurements on the aircraft could be subject to pressure errors due to rotor downwash. The probe is accurate to better than 1% and was tested and shown to be satisfactory over a speed range of 40 to 120 knots. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N81-33205*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
DEVELOPMENT OF AN ANALYTICAL TECHNIQUE FOR THE OPTIMIZATION OF JET ENGINE AND DUCT ACOUSTIC LINERS Semiannual Status Report, 3 Jan. - 31 Aug. 1981
Ben T. Zinn and William L. Meyer 1981 30 p refs
(Grant NAG1-133)
(NASA-CR-164872) Avail: NTIS HC A03/MF A01 CSCL 21E

A special integral representation of the external solutions of the Helmholtz equation is described. The analytical technique developed for the generation of the optimum acoustic admittance for an arbitrary axisymmetric body is also presented along with some numerical procedures and some preliminary results for a straight duct. A.R.H.

N81-33206*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMPLIFIED OFF-DESIGN PERFORMANCE MODEL OF A DAY TURBOFAN ENGINE CYCLE
Frederick J. Lallman Sep. 1981 33 p refs
(NASA-TM-83204) Avail: NTIS HC A03/MF A01 CSCL 21E

The specific thrust and fuel-air ratio for a dry turbofan engine cycle were calculated for several power levels over a range of altitudes and Mach numbers. The engine has a design fan pressure ratio of 2.9, compressor pressure ratio of 8.0, and bypass ratio of 0.6. Nominal engine component curves were picked to approximate the calculated data to construct a simplified model of the off-design performance of the engine. The model was then used to construct a simplified design-point engine model for the full-power condition. Author

N81-33207# Calspan Advanced Technology Center, Buffalo, N.Y.
MEASUREMENT OF HEAT FLUX AND PRESSURE IN A TURBINE STAGE Final Report, Jul. 1979 - Oct. 1980
Michael G. Dunn Wright-Patterson AFB, Ohio AFWAL Jul. 1981 48 p refs
(Contract F33615-79-C-2075; AF Proj. 3066)
(AD-A103539; CALSPAN-6549-A-2; AFWAL-TR-2055) Avail: NTIS HC A03/MF A01 CSCL 14/2

Selected portions of the first-stage stationary inlet nozzle, shroud, and rotor of the AiResearch TFE 731-2 turbine were instrumented with thin-film heat-transfer gages and heat-flux measurements were performed using a shock tunnel as a source of high-temperature, high-pressure gas. Experiments were performed over a range of Reynolds numbers, based on mid-annular stator chord, from 160,000 to 310,000 and corrected speeds from approximately 70% to 106%. The full-stage heat-flux results are cast in the form of a Stanton number and are then compared to previous measurements obtained with a stator only, in the absence of a rotor. The previous results are shown to be in good agreement with the full-stage data for the tip end-wall region, but the stator-only Stanton numbers for the stator airfoil are shown to be approximately 20% less than the corresponding full-stage results. Pressure measurements were obtained throughout the model and these results are shown to be in excellent agreement with the steady-state rig data for this turbine. Stanton-number results are also presented for the stationary shroud as a function of rotor mid-annular chord. The shroud Stanton-number data are shown to be in excess of the rotor blade results. Rotor-tip Stanton-number data are likewise shown to be slightly greater than the shroud results. Author (GRA)

N81-33208# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
BASIC EROSION INVESTIGATION IN SMALL TURBOMACHINERY Final Report
W. Tabakoff and T. Wakeman Jul. 1981 86 p refs
(Contract DAAG29-76-G-0229)
(AD-A103571; Rept-81-52; ARO-13653.10-E) Avail: NTIS HC A05/MF A01 CSCL 14/2

Description of the high temperature erosion facility at the University of Cincinnati is presented. A large portion of this investigation is devoted to the measurement and prediction of particle rebound characteristics. The abrasive particles were silica sand with average diameters of 165 microns impacting on the following materials: INCO 718, Ti 6-4, 2024 AL, RENE 150, Lead and Berillium. In addition, measurements of erosion rates were performed for materials used in jet engine blades. Semi-empirical equations were developed to predict erosion rates for INCO 718, Ti 6-4 and 2024 AL target materials.
Author (GRA)

N81-33209# Naval Postgraduate School, Monterey, Calif.
CALCULATIONS FOR AXIAL COMPRESSOR BLADING WITH UNIFORM INLET ENTHALPY AND RADIAL ENTHALPY GRADIENT
W. Schlachter May 1981 42 p refs
(Contract N00019-8-WR-11104)
(AD-A104093; NPS67-81-008) Avail: NTIS HC A03/MF A01 CSCL 21/5

A computer program was used to calculate the radial distribution of flow parameters in an axial compressor stage designed to have a symmetrical velocity diagram at the mean radius and particular variations of reaction from hub to tip. Uniform energy addition was assumed to occur in the rotor. Both cases of uniform enthalpy and uniform radial enthalpy gradient at the entrance to the stage were considered. Advantages were found in the selection of fully symmetric blading and in the use of the inlet enthalpy gradient as a design parameter. Author (GRA)

N81-33149# Rolls-Royce Ltd., Bristol (England).
MULTI-MISSION STOVL WITH VECTORED THRUST ENGINES
W. J. Lewis and P. Simplin (Rolls-Royce Ltd., Derby, England) *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 9 p (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N81-33210*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROPULSIVE LATERAL CONTROL NOZZLE Patent Application
Paul L. Coe, Jr. and Albert B. Graham, inventors (to NASA) (Old Dominion Univ.) Filed 18 Nov. 1980 9 p
(NASA-Case-LAR-12136-1; US-Patent-Appl-SN-208093) Avail: NTIS HC A02/MF A01 CSCL 01C

The invention relates to a trailing edge flap system useful in increasing low speed lift and low speed roll control in supersonic aircraft. Two trailing edge flaps (upper and lower) extend from the aircraft's engine exhaust nozzle. In the high lift mode of operation, a diverter block pushes the upper flap away from the nozzle, thereby exposing a flow passageway. Exhaust flow through the passageway tends to decrease boundary layer separation. To provide propulsive lateral control, the diverter block of one wing may be selectively closed, thereby reducing the lift on that wing. NASA

N81-33211*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR EVALUATION OF THE EFFECTS OF REDUCED SPOILER AND THRUST AUTHORITY ON A DECOUPLED LONGITUDINAL CONTROL SYSTEM DURING LANDINGS IN WIND SHEAR
G. Kimball Miller, Jr. Oct. 1981 51 p refs
(NASA-TM-83188; L-14652) Avail: NTIS HC A04/MF A01 CSCL 01C

The effect of reduced control authority, both in symmetric spoiler travel and thrust level, on the effectiveness of a decoupled longitudinal control system was examined during the approach and landing of the NASA terminal configured vehicle (TCV) aft flight deck simulator in the presence of wind shear. The evaluation was conducted in a fixed-base simulator that represented the TCV aft cockpit. There were no statistically significant effects of reduced spoiler and thrust authority on pilot performance during approach and landing. Increased wind severity degraded approach and landing performance by an amount that was often significant. However, every attempted landing was completed safely regardless of the wind severity. There were statistically significant differences in performance between subjects, but the differences were generally restricted to the control wheel and control-column activity during the approach. M.G.

N81-33145# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Helicopter Div.
CONTROLS AND DISPLAYS FOR ALL-WEATHER OPERATION OF HELICOPTERS
R. D. vonReth *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 15 p refs (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

N81-33126# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
CONTROL SYSTEM DESIGN BY OPTIMIZATION OF A VECTORIAL QUALITY CRITERIUM [REGLERENTWURF DURCH OPTIMIERUNG EINES VEKTORIELLEN GUETEKRITERIUMS]
R. Steinhauser *In* Hoschschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 1-18 refs In GERMAN (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N81-33212# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
TERMINAL AREA FORECASTS, FISCAL YEARS 1981 - 1992
Thomas F. Henry, Janice Hartwill, Carlton R. Wine, and Gene S. Mercer Feb. 1981 415 p
(AD-A095557; FAA-APO-80-10) Avail: NTIS HC A18/MF A01 CSCL 01/5

This document presents forecasts of key aviation activity measures for 906 airports including 330 radar approach control facilities through the fiscal year 1992. These forecasts are prepared to meet the planning needs of the Federal Aviation Administration (FAA) offices and services concerned with future traffic levels at these facilities. Except for specific regional requests, the airports selected for inclusion in this publication meet at least one of the following criteria: existing FAA tower; candidate for an FAA tower; currently receiving or forecast to receive certificated route air carrier or scheduled passenger commuter service; or any general aviation airport that will exceed 60,000 itinerant or 100,000 total operations annually by 1982. The Terminal Area (TAF) report is organized in two sections. The first part is a general summary. It includes summary highlights, the introduction, a brief overview of the forecast methodology, and a series of summary tables. Part two contains the forecast for each airport. The airport data include summary information for the facility followed by four years of historical data and annual projections for fiscal years (FY) 1981 through 1992. In some cases, a comment about current or planned aviation activity at the airport is included. The summary indicates the airport's tower/nontower status, number of hours the tower is operated daily, and the number of aircraft based at the airport. GRA

N81-33213# ARO, Inc., Arnold Air Force Station, Tenn.
NEW PARTICLE DIAGNOSTIC METHODS IN ARC-HEATED ABLATION/EROSION FACILITIES Final Report, 1 Oct. 1976 - 30 Sep. 1980
D. B. Brayton, B. W. Bomar, P. D. Elrod, and B. L. Seiber AEDC Aug. 1981 74 p refs Sponsored by AF
(AD-A103548; AEDC-TR-80-64) Avail: NTIS HC A04/MF A01 CSCL 14/2

Arc-heated flow facilities with injected particles are used at the Arnold Engineering Development Center (AEDC) to simulate the erosive and ablative/erosive environments encountered by spacecraft reentry through fog, clouds, thermonuclear explosions, etc. Newly developed electro-optical particle diagnostic techniques used to calibrate these facilities are discussed. Each of these techniques acquires data by optically probing the in-flight particle field. One technique measures particle velocity and is based on the detection of thermal radiation and/or chemiluminescence from the hot seed particles in a model ablation/erosion facility. A second technique measures a localized rate per unit area or mass flux of particles in a dust erosion tunnel (DET) facility; this technique is based on the photodetection of singular events caused by particles intercepting a laser beam. The third technique, similar to the latter, employs a multilaser beam arrangement to measure the velocity, two orthogonal dimensions of size, and the relative contribution of rate per unit area of individual, in-flight particles in the DET facility.
Author (GRA)

N81-33214# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geotechnical Research Branch.
FABRIC INSTALLATION TO MINIMIZE REFLECTION CRACK ON TAXIWAYS AT THULE AIRBASE, GREENLAND
Robert A. Eaton and Randy Godfrey May 1981 35 p refs
(DA Proj. 4K0-78012-AAM-1)
(AD-A103737; CRREL-SR-81-10) Avail: NTIS

HC A03/MF A01 CSCL 13/2

In August 1978 two types of fabrics were placed on sections of taxiways 1 and 3 of Thule AB, Greenland, to study the ability of fabrics with an AC 2.5 overlay to minimize reflection cracking in severe climates. Both fabrics should retain durability and mechanical strength under Thule's arctic conditions.

Author (GRA)

N81-33215# Goodyear Aerospace Corp., Akron, Ohio. Engineered Fabrics Div.

DEVELOPMENT OF A 5,000 BBI, RUBBERIZED FABRIC FUEL STORAGE TANK, COLLAPSIBLE Final Report, Jul. 1980 - Apr. 1981

Ronald L. Sosnowski Apr. 1981 170 p refs

(Contract DAAK70-79-C-0212)

(AD-A104005; GAC-19-1502) Avail: NTIS HC A08/MF A01 CSCL 13/4

This report describes the development of an experimental 5000 barrel, rapidly deployable, collapsible, rubberized fabric tank for the temporary storage of petroleum fuels. The project was executed in two phases, the first of which involved a state-of-the-art evaluation of the concept, and the second the manufacture and test of four model tanks and a full scale experimental prototype. The original objective of the project was to develop a 7,000 to 10,000 barrel tank, but logistic considerations favored a smaller tank size. The concept evaluation phase concluded that tanks in the 5,000 - 10,000 barrel capacity range were within the state-of-the-art, but that a 5,000 barrel container was the best configuration considering cost, weight and tank ground area. It was concluded that a 68' by 68' tank made using 12 oz per sq yd nylon cloth coated with nitrile rubber would be the most efficient configuration for the prototype tank. A tank of this configuration and four 250 gallon models were fabricated in Phase 2 using existing production facilities and technology. Assembly tests on the models were performed successfully, as were destructive tests of materials used in fabricating the tanks. The prototype and model tanks were then delivered to the Army for field trials. This report describes the work performed in Phase 2 of the contract, but the final Phase 1 report is attached as an Appendix for easy reference.

Author (GRA)

N81-33216# Mitre Corp., McLean, Va.

UPGRADED FAA AIRFIELD CAPACITY MODEL. VOLUME 1: SUPPLEMENTAL USER'S GUIDE

William J. Swedish Washington FAA Feb. 1981 119 p refs

(Contract DT-FA01-81-C-10001)

(AD-A104154; MTR-81W16-Vol-1; FAA-EM-81-1-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 01/2

Input and output formats for easier usage and for the capability to compute runway capacity for up to eleven different percentages of arrivals in a single run (as opposed to a separate run for each percentage) are presented. Provisions for calculating the capacity of alternating arrivals to a pair of parallel runways are highlighted. Several other runway configurations were added to the model. Other changes made to the internal logic of the model which results in reduced running times and/or improved accuracy. The resulting capacities may, therefore, differ from the results obtained with the previous version. In most cases this will not affect the ranking of the potential airfield changes under evaluation. T.M.

N81-33217# Mitre Corp., McLean, Va.

UPGRADED FAA AIRFIELD CAPACITY MODEL. VOLUME 2: TECHNICAL DESCRIPTION OF REVISIONS

William J. Swedish Washington FAA Feb. 1981 161 p refs

(Contract DT-FA01-81-C-10001)

(AD-A104155; MTR-81W16-Vol-2; FAA-EM-81-1-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 01/2

The FAA Airfield Capacity Model, a computer program designed to quickly calculate the runway capacity of an airport, has recently been upgraded. Several new features have been implemented in the upgraded version. Among these are improved input and output formats for easier usage, the capability to compute runway capacity for up to eleven different percentages of arrivals in a single run (as opposed to a separate run for each percentage), and provisions for calculating the capacity of alternating arrivals to a pair of parallel runways. Several other runway configurations have been added to the model, or improved, as well. Other changes have been made to the internal logic of the model which will result in reduced running times and/or improved accuracy. The resulting capacities may, therefore, differ from the results obtained with the previous version. In most cases this will not affect the ranking of the potential airfield changes under evaluation. This report documents the upgraded FAA Airfield Capacity Model. Volume 2 is a detailed technical description of the revisions to the program, including flow charts of the logic and evaluations of various alternative logics. This volume is intended as a programmer's guide, but it may also be useful for the experienced analyst who desires a fuller understanding of the model. GRA

N81-33218# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.

DESIGN AND CALIBRATION OF THE NBS ISOTROPIC ELECTRIC FIELD MONITOR (EFM-5), 0.2 TO 1000 MHz

E. B. Larsen and F. X. Ries Mar. 1981 113 p refs Sponsored in part by Army

(PB81-207896; NBS-TN-1033) Avail: NTIS HC A06/MF A01 CSCL 14B

A broadband RF radiation monitor was developed at NBS for the frequency range of 200 kHz to 1000 MHz. The isotropic antenna unit consists of three mutually-orthogonal dipoles, each 5 cm long by 2 mm wide. The receiver has an accurate measurement range of 1 to 1000 V/m. The readout indication is in terms of the Hermitian or total magnitude of the electric (E) field strength, which is equal to the root-sum-square value of three perpendicular E-field components at the measurement point. GRA

N81-33219# Water and Power Resources Service, Denver, Colo. Engineering and Research Center.

DESIGN AND DEVELOPMENT OF AN AUTOMATED HYDROSTATIC FLEXIBLE MEMBRANE TEST FACILITY

Ronald K. Frobel Jan. 1981 31 p

(PB81-210809; REC-ERC-80-9) Avail: NTIS HC A03/MF A01 CSCL 14B

An automated test facility for pressure testing flexible membrane liners over various subgrades and under various operating conditions is described. The designs for the pressure vessels, system components, and computer software are given. Although the test facility is new, it was subjected to thorough preliminary testing and is functional for laboratory use. The test facility will be used for future testing and research on other hydraulic barrier materials, geotechnical fabrics, and soils. GRA

N81-33146# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE ROLE OF THE RESEARCH SIMULATOR IN THE SYSTEMS DEVELOPMENT OF ROTORCRAFT

Irving C. Statler and Arlin Deel *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 21 p refs Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif. (For primary document see N81-33137 24-01)

Avail: NTIS HC A12/MF A01 CSCL 14B

N81-33333# Stuttgart Univ. (West Germany).

TEST STAND FOR THE OUTPUT STAGE [ENDSTUFENVERSUCHSSTAND]

J. Jarosch, G. Eyb, and H. Elsasser *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 251-267 In GERMAN Sponsored in part by Deutsch Forschungsgeimschaft (For primary document see N81-33321 24-31)

Avail: NTIS HC A16/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

No abstracts in this category.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N81-33220*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
SUBSATELLITE ORBITAL ANALYSIS PROGRAM (SOAP) USER'S GUIDE
K. G. Castle, J. M. Voss, and J. S. Gibson Jul. 1981 294 p refs
(Contract NAS9-15800)
(NASA-CR-161088; LEMSCO-16583; JSC-17471) Avail: NTIS HC A13/MF A01 CSCL 22A

The features and use of the subsatellite operational analysis are examined. The model simulates several Earth-orbiting vehicles, their pilots, control systems, and interaction with the environment. The use of the program, input and output capabilities, executive structures, and properties of the vehicles and environmental effects which it models are described. E.A.K.

N81-33221# Geodetic Inst., Helsinki (Finland).
QIKAIM, A FAST SEMINUMERICAL ALGORITHM FOR THE GENERATION OF MINUTE-OF-ARC ACCURACY SATELLITE PREDICTIONS
Martin Vermeer 1981 29 p refs
(Rept-81:1; ISBN-951-711-068-5; ISSN-0355-1962) Avail: NTIS HC A03/MF A01

A program was designed to replace AIMLASER for the generation of aiming predictions, to achieve a major saving in computing time, and to keep the program small enough for use even on small systems. An approach was adopted that incorporated the numerical integration of the orbit through a pass, limiting the computation of osculating elements to only one point per pass. The numerical integration method which is fourth order in delta t in the cumulative error after a given time lapse is presented. Algorithms are explained and a flowchart and listing of the program are provided. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N81-33222*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SYSTEMS TEST FACILITIES EXISTING CAPABILITIES COMPILATION
Robert Weaver 1 Aug. 1981 45 p refs
(Contracts NAS7-100; DE-A101-76ET-20356; JPL Proj. 5240-3)
(NASA-CR-164851; DOE/ET-20356/1; JPL-Pub-81-14) Avail: NTIS HC A03/MF A01 CSCL 14B

Systems test facilities (STFS) to test total photovoltaic systems and their interfaces are described. The systems development (SD) plan is compilation of existing and planned STFs, as well as subsystem and key component testing facilities. It is recommended that the existing capabilities compilation is annually updated to provide and assessment of the STF activity and to disseminate STF capabilities, status and availability to the photovoltaics program. E.A.K.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N81-33223*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAUNCH SUMMARY FOR 1980
Robert W. Vostreys Jul. 1981 38 p refs
(NASA-TM-84020; NSSDC/WDC-A-R&S-81-07) Avail: NTIS HC A03/MF A01 CSCL 22A

Sounding rockets, artificial Earth satellites, and space probes launched betweeen January 1 and December 31, 1980 are listed. Data tabulated for the rocket launchings show launching site, instruments carried, date of launch, agency rocket identification, sponsoring country, experiment discipline, peak altitude, and the experimenter or institution responsible. Tables for satellites and space probes show COSPAR designation, spacecraft name, country, launch date, epoch date, orbit type, apoapsis, periapsis and inclination period. The functions and responsibilities of the World Data Center and the areas of scientific interest at the seven subcenters are defined. An alphabetical listing of experimenters using the sounding rockets is also provided. A.R.H.

N81-33224*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NSSDC DATA LISTING
Sep. 1981 66 p
(NASA-TM-84026; NSSDC/WDC-A-R/S-81-11) Avail: NTIS HC A04/MF A01 CSCL 22A

A convenient reference to space science and supportive data available from the National Space Science Data Center (NSSDC) is provided. Satellite data are organized by NSSDC spacecraft common name. The launch date and NSSDC ID are given. Experiments are listed alphabetically by the principal investigator or team leader. The experiment name and NSSDC ID, data set ID, data set name, data form code, quantity of data, and the time span of the data as verified by NSSDC are shown. Ground-based data, models, computer routines, and composite spacecraft data that are available from NSSDC are listed alphabetically by discipline, source, data type, data content, and data set. The data set name, data form code, quantity of data, and the time span covered where appropriate are included. A.R.H.

N81-33225# Kayser Threde G.m.b.H., Munich (West Germany).
STUDY OF THE DEFINITION OF SMALL EJECTABLE PROBES Final Report
Peter Burkert and Guenter Schmitt Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 116 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-009; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24,35

The boundary conditions which occur during ejection of probes from rocket payloads is presented for the users of these probes, both in space research and in other fields. Typical Nike-Apache, Skylark 7, and Aries payloads were assumed as models. All three are already used in the German rocket program. Flight trajectories and relevant flight parameters in the Kepler field are calculated. The physical data of ejectable probes and ejection mechanisms were discussed. Author (ESA)

N81-33226# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Apparate.
ANALYTICAL DETERMINATION OF DYNAMIC STABILITY PARAMETERS
C. P. Schneider 1980 41 p refs Sponsored by the West German Ministry of Defence
(MBB-UA-522/80(OE)) Avail: NTIS HC A03/MF A01

Prediction methods and results are grouped according to those which lead to expressions of the derivatives in closed forms, such as slender body theory, and those which require numerical procedures. Derivatives of longitudinal stability are discussed in detail. For subsonic flow conditions, derivatives of missile components were investigated at high angles of attack and a simplified, quasisteady treatment is given for rigid missile components under steady flight conditions. The possibility of obtaining stability derivatives of bodies at high angles of attack in supersonic flight is discussed. Author (ESA)

N81-34116# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
A PLANAR MODEL OF THE PROBE ELECTRIC ENVIRONMENT
Rejean J. L. Grard *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 39-45 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

N81-33127# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Hauptabt. Raumflugmissionen.
PHYSICAL SIMULATIONS IN SATELLITE DYNAMICS
R. Stapf *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 21-41 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N81-33227# Committee on Science and Technology (U. S. House).
FLIGHT OF STS-1 WITH ASTRONAUTICS JOHN W. YOUNG AND CAPTAIN ROBERT L. CRIPPEN
Washington GPO 1981 21 p Hearing before the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 19, 20 May 1981
(GPO-82-245) Avail: Committee on Science and Technology

The STS-1 main engine results and external tank results are presented. The solid rocket booster retrieval operations were reported. The damage sustained by the launch pad was described. Descriptions of several in-flight operations are provided by the astronauts. T.M.

N81-33228# Naval Surface Weapons Center, White Oak, Md.
SPACE SHUTTLE RANGE SAFETY COMMAND DESTRUCT SYSTEM ANALYSIS AND VERIFICATION. PHASE 1: DESTRUCT SYSTEM ANALYSIS AND VERIFICATION Final Report
W. M. Hinckley, D. L. Lehto, N. L. Coleburn, A. J. Gorechlad, J. M. Ward, and J. Petes Mar. 1981 363 p refs
(AD-A103453; NSWC-TR-80-417) Avail: NTIS HC A16/MF A01 CSCL 22/2

The planned Duplex Command Destruct System (one linear-shaped charge (LSC) on each solid rocket booster (SRB) was analyzed for destruct effectiveness at all times of flight and for unintentional separation of one SRB of the Orbiter. The destruct system was found to be only marginally effective in destructing the external tank (ET) and dispersing the propellants for the first 50 seconds of flight. Further, inadvertent separation of one SRB results in cluster (SRB/ET/Orbiter) breakup within as little as 5 seconds, rendering the SRB mounted destruct system ineffective for destructing the ET. Author (GRA)

N81-33229# Naval Surface Weapons Center, White Oak, Md.
SPACE SHUTTLE RANGE SAFETY COMMAND DESTRUCT SYSTEM ANALYSIS AND VERIFICATION. PHASE 3: BREAKUP OF SPACE SHUTTLE CLUSTER VIA RANGE SAFETY COMMAND DESTRUCT SYSTEM Final Report
W. M. Hinckley, D. L. Letho, N. L. Coleburn, A. J. Gorechlad, J. M. Ward, and J. Petes Mar. 1981 141 p refs
(AD-A103530; NSWC/TR-80-417) Avail: NTIS HC A07/MF A01 CSCL 22/2

The Triplex Destruct System (LCS's on each SRB and on ET) was analyzed for effectiveness for the entire ascent portion of the flight. LSC size/placements were established, LOX/LH2 vent times were predicted, SRB depressurization times were calculated, and SRB/ET/Orbiter structural breakup pattern and times were determined. Further, debris weight and aerodynamic characteristics are presented for use in future hazard analyses. Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-33230*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
IMPLICATIONS OF ARCING DUE TO SPACECRAFT CHARGING ON SPACECRAFT EMI MARGINS OF IMMUNITY Final Report
George T. Inouye 10 Mar. 1981 171 p refs
(Contract NAS3-21961)
(NASA-CR-165442; TRW-36186-6016-UE-00) Avail: NTIS HC A08/MF A01 CSCL 22B

Arcing due to spacecraft charging on spacecraft EMI margins of immunity was determined. The configuration of the P78-2 spacecraft of the SCATHA program was analyzed. A brushfire arc discharge model was developed, and a technique for initiating discharges with a spark plug trigger was for data configuration. A set of best estimate arc discharge parameters was defined. The effects of spacecraft potentials in limiting the discharge current blowout component are included. Arc discharge source models were incorporated into a SEMCAP EMI coupling analysis code for the DSP spacecraft. It is shown that with no mission critical circuits will be affected. E.A.K.

N81-34117# Technische Hochschule, Darmstadt (West Germany). Angewandte Geophysik.
SYMMETRIC MODEL OF SPACECRAFT CHARGING AND PLASMA EMISSION EFFECTS
H. Maassberg, U. Isensee, and G.-H. Voigt *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 47-65 refs Sponsored by Bundesministerium fuer Forschung- und Technologie and DFVLR (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

N81-34120# Bern Univ. (Switzerland). Physikalisches Inst.
CONSEQUENCES OF THE COMA ENVIRONMENT OF COMET HALLEY FOR A FAST FLYBY SPACECRAFT
D. T. Young *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 91-96 refs Sponsored by ESA (For primary

document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N81-33231*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Structures and Propulsion Lab.
FEASIBILITY STUDY OF LITVC FOR SHUTTLE SRB
C. L. Martin and L. B. Powers Sep. 1981 19 p ref
(NASA-TP-1912; M-354) Avail: NTIS HC A02/MF A01 CSCL 21H

A liquid injection thrust vector control (LITVC) system for the shuttle solid rocket booster (SRB) was analyzed. The LITVC was compared with the SRB baseline flexible seal. A table of LITVC advantages and disadvantages is presented. It is concluded that the LITVC performs well at low to moderate duty cycles, but not for high duty cycle requirements. E.A.K.

N81-33232# National Aerospace Lab., Tokyo (Japan).
INJECTION AND COMBUSTION CHARACTERISTICS OF UNLIKE-IMPINGING TRIPLET INJECTOR FOR LOX-KEROSENE ROCKET COMBUSTOR
Hiroshi Tamura, Yoshio Wakamatsu, Akio Suzuki, Mitsuo Toyokawa, and Fumei Ono 1981 52 p refs In JAPANESE; ENGLISH summary
(NAL-TR-648; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

The injector element types considered are the OFO type, which consists of two outer oxidizer jets and one central fuel jet, and the FOF type, which consists of two fuel jets and one oxidizer jet. The spray characteristics of typical single elements of the two types were investigated through cold flow tests. Based on these tests, three multiple element injectors (20 and 40 elements, 10 kN thrust at 2 MPa chamber pressure) were designed and fabricated, and were evaluated by means of cold flow tests and firing tests with combustion chambers of various lengths. The results were compared with a theoretical analysis based on a vaporization model. T.M.

N81-33233# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF PARTICULATE BEHAVIOR IN SOLID ROCKET MOTORS
Stavros George Karagounis Jun. 1981 108 p refs
(AD-A104118) Avail: NTIS HC A06/MF A01 CSCL 21/9

An apparatus was developed which used diffractively-scattered laser power spectra measurements for determination of exhaust particulate size from solid rocket motors. The apparatus was calibrated by using glass beads and aluminum oxide powder, and then used with success to estimate the mean diameter of the exhaust particles of a small solid rocket motor. Scanning electron microscope measurements of the exhaust particles were employed for comparison and verification. Holographic pictures from burning propellant strands and slabs of different compositions were obtained at different pressures and compared to corresponding high speed, high resolution motion pictures.
Author (GRA)

N81-33234# California Inst. of Tech., Pasadena.
MEASUREMENTS OF ENERGY LOSSES ASSOCIATED WITH INTERACTIONS BETWEEN ACOUSTIC WAVES AND NON-UNIFORM STEADY FLOW Final Report, 1 Feb. 1979 - 30 Nov. 1980
F. E. C. Culick, K. Magiawala, J. Wat, E. Awad, and T. Kubota Jul. 1981 128 p refs
(Contract F04611-80-X00013; AF Proj. 5730)
(AD-A104185; AFRPL-TR-81-22) Avail: NTIS HC A07/MF A01 CSCL 21/2

An experimental program has been conducted to study interactions between acoustics waves and two types of non-uniform average flow occurring in solid propellant rockets. Measurements in a resonance tube confirmed the existence of an energy loss associated with interactions between a longitudinal acoustic field and an average flow entering through a lateral boundary. The measured loss was approximately five times as large as that predicted by a simple one-dimensional analysis. However, due to the large experimental uncertainty associated with these results, the confidence level of their quantitative validity is low. In the second part of the program, a small supersonic wind tunnel has been operated open cycle with the test section, upstream of a choked nozzle, used as an impedance tube to measure the admittance function for the nozzle. Limited results for simulated submerged nozzles suggest that secondary flow has little influence on the admittance function for the aft end of the chamber. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N81-33235* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METHOD OF MAKING A PARTIAL INTERLAMINAR SEPARATION COMPOSITE SYSTEM Patent
Wolf Elber, inventor (to NASA) Issued 23 Jun. 1981 5 p Filed 7 Feb. 1980 Supersedes N81-16128 (19 - 07, p 0870) Division of US Patent Appl. SN-889671, filed 24 Mar. 1978, US Patent-4,229,473
(NASA-Case-LAR-12065-2; US-Patent-4,274,901; US-Patent-Appl-SN-119337; US-Patent-4,229,473; US-Patent-Appl-SN-889671; US-Patent-Class-156-242; US-Patent-Class-156-245; US-Patent-Class-156-252; US-Patent-Class-156-264; US-Patent-Class-156-285; US-Patent-Class-156-290) Avail: US Patent and Trademark Office CSCL 11D

An interlaminar separation system for composites is disclosed a thin layer of a perforated foil film is interposed between adjacent laminae of a composite formed from prepreg tapes. Laminae adherence takes place through the perforations and a composite structure with improved physical property characteristics is produced.
Official Gazette of the U.S. Patent and Trademark Office

N81-33236*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ENVIRONMENTAL EFFECTS ON FOD RESISTANCE OF COMPOSITE FAN BLADE Final Report
G. C. Murphy and C. T. Selemme Jan. 1981 274 p
(Contract NAS3-21017)

(NASA-CR-165211; R81AEG694) Avail: NTIS HC A12/MF A01 CSCL 11D

The sensitivity of the impact characteristics of typical polymeric composite fan blade materials to potential limiting combinations of moisture, temperature level and temperature transients was established. The following four technical tasks are reported: (1) evaluation and characterization of constituent blade materials; (2) ballistic impact tests; (3) leading edge impact protection systems; and (4) simulated blade spin impact tests. E.A.K.

N81-33237*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

AN ENDOCHRONIC THEORY FOR TRANSVERSELY ISOTROPIC FIBROUS COMPOSITES Interim Report

Marek-Jerzy Pindera and Carl T. Herakovich Oct. 1981 245 p refs

(Contract NCC1-15)

(NASA-CR-164747; VPI-E-81-27; IR-25) Avail: NTIS HC A11/MF A01 CSCL 11D

A rational methodology of modelling both nonlinear and elastic dissipative response of transversely isotropic fibrous composites is developed and illustrated with the aid of the observed response of graphite-polyimide off-axis coupons. The methodology is based on the internal variable formalism employed within the text of classical irreversible thermodynamics and entails extension of Valanis' endochronic theory to transversely isotropic media. Applicability of the theory to prediction of various response characteristics of fibrous composites is illustrated by accurately modelling such often observed phenomena as: stiffening reversible behavior along fiber direction; dissipative response in shear and transverse tension characterized by power-laws with different hardening exponents; permanent strain accumulation; nonlinear unloading and reloading; and stress-interaction effects. Author

N81-33238# National Aerospace Lab., Tokyo (Japan). First Airframe Div.

ANTI-SYMMETRIC ELASTIC PROPERTIES OF COMPOSITE PLATES OF SATIN WEAVE CLOTH

Takashi Ishikawa Jan. 1981 18 p refs

(NAL-TR-649T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Composite plates made of satin weave fabric show macroscopic antisymmetricity and coupling effects. The essential mechanism of such behavior is basically clarified. Closed form solutions of the upper and lower bounds of the stiffness and compliance are obtained by the simplest series model in connection with the uniform stress and strain assumptions. Finite element analyses using 3-D isoparametric elements are also conducted. The solutions fall between both bounds within a certain restriction. The deviation of the actual quasimicromechanical conditions from the simple assumptions can be observed through the FEM results. Rough estimation of thermal warping coefficients is carried out for carbon/epoxy and glass/polyimide 8th harness satin composites by simple measurements. More accurate results are provided by experiments for measuring thermal deflection under a small temperature change. These results confirm the theoretical predictions by both methods. Several comments on ways of preventing such phenomena are made based on the geometry of the fabric structures. Author

N81-33239# Stanford Univ., Calif. Div. of Applied Mechanics.

HOMOGENIZATION AND LINEAR THERMOELASTICITY Interim Report

Gilles A. Francfort Aug. 1981 27 p refs

(Contract N00014-76-C-0054; NR Proj. 064-525)

(AD-A103640; SU-SUDAM-81-4) Avail: NTIS HC A03/MF A01 CSCL 20/13

We study homogenization of linear dynamic thermoelasticity with rapidly varying coefficients, using a semi-group approach. The resulting homogenized problem exhibits an unusual change in initial temperature. A formal asymptotic analysis predicts fast time oscillations in the temperature field. These oscillations explain the temperature shift, and show that, for our problem, weak convergence in time in the best convergence that one can obtain. Author (GRA)

N81-33240# SRI International Corp., Menlo Park, Calif.

ENGINEERING EFFECTS OF ADVANCED COMPOSITE MATERIALS ON AVIONICS Final Technical Report, Sep. 1980 - Jun. 1981

W. Graf, J. Hamm, J. E. Navevicz, and D. E. Tremain Jul. 1981 132 p refs

(Contract DAAK80-80-C-0806)

(AD-A104015; USAAVRADCOM-80-0806-F) Avail: NTIS HC A07/MF A01 CSCL 11/4

This report discusses the effects of advanced composite materials on avionics equipment. Over 80 reports and articles on this subject have been collected; the bibliographic data resides in an on-line computer data base. A summary of previous and ongoing work is included. The impact of composite materials on avionics systems and subsystems is discussed, and the major problem areas identified (viz., lightning, EMP protection, antenna performance, EMI/EMC, and radar cross section reduction). Possible solutions and approaches to these problems are presented and the importance of tradeoff studies at the system level is stressed. Problems peculiar to helicopters are reviewed separately. The relation of this contract to the Advanced Composite Airframe Program (ACAP) is also discussed. Appendices present technical background on interference control and E3 hardening concepts. An extensive bibliography is included. Author (GRA)

N81-33241# General Dynamics/Convair, San Diego, Calif.

DEVELOPMENT OF ADVANCED INTERCEPTOR SUBSTRUCTURAL MATERIAL Final Report, 5 Sep. 1979 - 30 Sep. 1980

Norman R. Adsit and Julius Hertz Jul. 1981 129 p refs

(Contract DAAG46-79-C-0081; DA Proj. 1W1-62113-A-661)

(AD-A103836; AMMRC-TR-81-32) Avail: NTIS HC A07/MF A01 CSCL 11/4

The work reported herein is aimed at the development of ultra-high-modulus graphite/epoxy structures for use in future advanced terminal interceptors (ATI). The work has shown that gore section layup used to fabricate interceptor frusta do not effect the strength or modulus of the frusta. Tests on flat panels representation of full thickness joints substantiated that the end joints will carry ATI loads. Finally, two short but full thickness frusta with antenna window cutouts were fabricated and tested. These frusta met the design goals. Analysis work has been completed and the design and materials are ready for a full-scale demonstration. To accomplish this, the preliminary design was reviewed and has been updated. A full-scale tool was designed and has been procured. Finally, a manufacturing process plan for the full-scale frustum was prepared. GRA

N81-33242# Naval Ship Research and Development Center, Bethesda, Md.

STRUCTURAL ANALYSIS METHODS AND ELASTIC PROPERTY DETERMINATION FOR LAMINATED COMPOSITES Final Report

Milton O. Critchfield Aug. 1981 91 p refs

(AD-A104081; DTNSRDC-81/018) Avail: NTIS HC A05/MF A01 CSCL 11/4

Recent applications of laminated composites to ship structural components have highlighted both the analytical complexities involved and the need for providing the structural designer and analyst with appropriate laminate analysis methods. To this end, three types of analytical methods, traditionalloy applied to metallic ship structural components, have been extended to the analysis of laminated composites; procedures for their implementation are discussed. These methods include: (a) strength-of-materials techniques for laminated beam and column members; (b) classical analysis methods for the bending, buckling, and vibration of laminated plating; and (c) finite-element techniques for either individual laminated components or more complex hybrid structures. Finite-element approaches are discussed for investigating both the in-plane stresses in the individual layers of a laminate and the interlaminar shear and normal stresses which frequently govern near discontinuities in laminate cross sections. The use of these three analysis techniques necessitates that laminated composite components be analyzed as nonlaminated components having equivalent stiffness during in-plane axial and shear and out-of-plane bending responses. Three kinds of equivalent elastic properties for laminates are defined, and methods are presented for calculating each of them. Since these computational

procedures may be quite lengthy for laminates with more than a few layers, a computer program is referenced which automates the procedures. GRA

N81-33243# California Univ., Livermore. Lawrence Livermore Lab.
FTIR STUDIES OF THE CHEMICAL STRUCTURE OF HIGH-PERFORMANCE COMPOSITE MATRICES
Eleno T. Mones and Roger J. Morgan Mar. 1981 9 p refs Presented at the Natl. Am. Chem. Soc. Summer Meeting, New York, 24-28 Aug. 1981
(Contract W-7405-eng-48)
(DE81-021060; CONF-810813-6; UCRL-85789) Avail: NTIS HC A02/MF A01

Diaminodiphenyl sulfone (DDS) cured tetraglycidyl 4, 4 prime diaminodiphenyl methane (TGDDM) epoxies are the most commonly used matrices for high performance fibrous composites. Fourier transform infrared spectroscopy (FTIR) studies of the cure reactions of these epoxies are reported as a function of cure conditions. From these studies, the TGDDM epoxide was found to undergro intermolecular homopolymerization to form either linkages in the absence of DDS. The epoxide groups can also isomerize. Such reactions are accelerated by epoxide impurities and a BF3 catalyst, and also occur in the presence of DDS. DOE

N81-33244# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials Science and Mineral Engineering.
PRE-EUTECTIC DENSIFICATION IN MgF SUB 2 - CaF SUB 2
S. C. Hu May 1981 94 p refs
(Contract W-7405-eng-48)
(DE81-027553; LBL-12849) Avail: NTIS HC A05/MF A01

Arrested zone sintering, constant heating rate sintering, and constant temperature sintering were used in a study of microstructural evolution and shrinkage vs temperature behavior. It was found that the sintering rate of MgF2 was enhanced by CaF2 eutectic additive, and that the enhancement of sintering started at about 2000 C below the eutectic temperature. The effect of CaF2 saturates at about 1 wt percent. By comparing the diffusivities obtaind from diffusion experiment and constant temperature sintering experiment, it is concluded that the enhanced pre-eutectic densification kinetics result from increased solid state grain boundary transport due to eutectic forming phase. The possible effect of oxidation on the eutectic temperature of CaF2 - MgF2 during the experiment was verified to strengthen the conclusion that solid state mass transport causes the enhancement. Auger analysis shows that Ca(2) is enriched at grain boundaries in a layer with a thickness of about 100 A. DOE

N81-33245# California Univ., Livermore. Lawrence Livermore Lab.
STRUCTURE-PROPERTY RELATIONS OF KEVLAR 49 FIBERS
C. O. Pruneda, W. J. Steele, R. P. Kershaw, and R. J. Morgan Mar. 1981 10 p refs Presented at Natl. Am. Chem. Soc. Summer Meeting, N.Y., 23 Aug. 1981
(Contract W-7405-eng-48)
(DE81-769971; UCRL-85744; CONF-810813-3) Avail: NTIS HC A02/MF A01

The relation between the physical structure and deformation and failure processes of Kevlar fibers is presented. The fiber fabrication processes that affect the optical structural parameters controlling deformation and failure are considered. The deformation and failure processes are discussed in the light of fracture topography studies of epoxy composite strands and nonetched and HCl etched bare yarns together with deformation studies of bare yarns deformed directly in the optical microscope. A physical model is suggested for Kevlar 49 in which there is an amorphous skin and crystalline core. The core consists of periodic transverse defect plates spaced about 200 nm along the fiber. Chain ends are assumed to cluster within the vicinity of these planes. The noncrystalline skin in which the chain ends are arranged essentially randomly relative to one another does not contain such transverse weak planes. DOE

N81-33147# Societe Nationale Industrielle Aerospatiale, Marignane (France.)
APPLICATIONS OF COMPOSITE MATERIALS FOR THE CONSTRUCTION OF MILITARY HELICOPTERS [APPLICATIONS DES MATERIAUX COMPOSITES POUR LA CONSTRUCTION D'HELICOPTERES MILITAIRES]
A. Sourdon and G. Beziac *In* AGARD The Impact of Mil. Appl. on Rotorcraft and V/STOL Aircraft Design Jun. 1981 21 p refs In FRENCH (For primary document see N81-33137 24-01)
Avail: NTIS HC A12/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N81-33246* National Aeronautics and Space Administration. Pasadena Office, Calif.
COAL DESULFURIZATION Patent
George C. Hsu, inventor (to NASA) (JPL, California Inst. of Technology, Pasadena) Issued 27 Mar. 1981 5 p Filed 16 Feb. 1978 Supersedes N78-33164 (16 - 24, p 3185) Sponsored by NASA
(NASA-Case-NPO-14272-1; US-Patent-4,146,367; US-Patent-Appl-SN-878253; US-Patent-Class-44-1R; US-Patent-Class-44-2; US-Patent-Class-201-17) Avail: US Patent and Trademark Office CSCL 07D

Organic sulfur is removed from coal by treatment with an organic solution of iron pentacarbonyl. Organic sulfur compounds can be removed by reaction of the iron pentacarbonyl with coal to generate CO and COS off-gases. The CO gas separated from COS can be passed over hot iron fillings to generate iron pentacarbonyl.

Official Gazette of the U.S. Patent and Trademark Office

N81-33247# Washington Univ., Seattle. Dept. of Chemistry.
HIGH TEMPERATURE GAS ENERGY TRANSFER Annual Summary Report, 1 Aug. 1980 - 31 Jul. 1981
B. S. Rabinovitch 9 Aug. 1981 19 p refs
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A103467) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work under this contract is summarized. Five technical reports have been issued. The effect of molecular parameters - vibrational eigenstate density and intermolecular attractive potential - on gas-surface vibrational energy transfer - has been documented. The VEM technique has been refined to single collision measurements that provide a more sensitive test of energy transfer models. Study of cyclopropane to 1300 K shows a decline in collision efficiency with rise of temperature. Strong collision behavior is found at low gas-surface temperatures. Author (GRA)

N81-33248# Arizona Univ., Tucson.
ENERGY-LEVEL AND GROTRIAN DIAGRAMS FOR MANGANESE Final Report, 1 Jul. 1980 - 30 Jun. 1981
Stanley Bashkin 25 Aug. 1981 3 p
(Contract N00014-80-C-0839)
(AD-A103621) Avail: NTIS HC A02/MF A01 CSCL 07/2

Energy-level and Grotrian diagrams were completed for all stages of ionization of manganese. Funds were provided under this grant to permit completion of the energy-level and Grotrian diagrams for the element manganese in all stages of ionization. Such drawings were to extend the series of volumes dealing with the pictorial representations of data gathered from atomic spectroscopy. Previous work along this line led to the publication of two volumes and an addendum volume; a third volume is now in the final stages of publication. It is a pleasure to report that the manganese project has now been finished. All the drawings have been inked and corrected. The text which is to accompany the drawings is currently being prepared; all systems through Mn VII have been described and the relevant

references summarized. In addition, certain mechanical work having to do with the clarity of representation of the data is in progress. GRA

N81-33249# Massachusetts Inst. of Tech., Cambridge.
LAMINAR COMBUSTION AT HIGH TEMPERATURES AND PRESSURES Final Report, 1 Feb. 1978 - 31 Dec. 1980
James C. Keck 30 Jul. 1981 7 p refs
(Contract DAAG29-78-C-0010)
(AD-A103559; ARO-15170.3-E) Avail: NTIS HC A02/MF A01 CSCL 21/2

Burning velocities of practical fuel-air mixtures of interest for internal combustion engines were measured at high temperature and pressure using the constant volume bomb method. In addition the total hydrocarbons in the combustion products were measured using a flame ionization detector. The fuels investigated included methane, propane, isooctane, methanol and indolene. The measurements covered fuel-air equivalence ratios from 0.7 to 1.6, pressures from 0.4 to 50 atm., unburned gas temperature from 298 to 700 K and residual gas mass fractions from 0 to 0.2. GRA

N81-33250# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
APPLICATION OF COHERENT ANTI-STOKES RAMAN SCATTERING TO COMBUSTION MEDIA Final Technical Report, 31 May 1977 - 30 Jul. 1980
Larry P. Goss and Gary L. Switzer Wright-Patterson AFB, Ohio AFWAL Feb. 1981 168 p refs
(Contract F33615-77-C-2019; AF Proj. 2301; AF Proj. 3048)
(AD-A103932; AFWAL-TR-80-2122; SRL-6948) Avail: NTIS HC A08/MF A01 CSCL 21/2

A laboratory-based system utilizing the Nd:YAG laser has been developed to investigate the Coherent Anti-Stokes Raman Scattering (CARS) of molecular gases in combustion. Single-shot and simultaneous experimental measurements of species concentration and temperature of combustion media are reported and compared with other optical techniques and theoretical predictions. The adverse effects of beam propagation through turbulence are investigated and discussed. A transportable hardened CARS system, constructed to operate in adverse environments, has been used to conduct a series of investigations in a practical combustion tunnel. Temperature and number-density measurements made as a function of fuel-air flow, position in the combustion tunnel, and fuel variation--including both gaseous and liquid fuels--are reported. Author (GRA)

N81-33251# Wisconsin Univ. - Madison. Mathematics Research Center.
MOLECULAR TRANSPORT EFFECTS IN TURBULENT DIFFUSION FLAMES AT MODERATE REYNOLDS NUMBER
R. W. Bilger (Sydney Univ.) Jul. 1981 38 p refs
(Contract DAAG29-80-C-0041)
(AD-A103869; MRC-TSR-2236) Avail: NTIS HC A03/MF A01 CSCL 21/2

In flames molecular diffusivities are enhanced by the high temperatures and can be of the same order as turbulent diffusivities in flames of moderate Reynolds number. A perturbation analysis is used to quantify effects in a hydrogen/air diffusion flame which arise from differential molecular diffusivities. The analysis uses perturbations about the equal diffusivity, adiabatic, equilibrium theory commonly used and yields solutions for the average and higher moments for the departures in normalized element mass fractions and enthalpy. The results are compared with the laser-Raman measurements of Drake, et al. in a relatively low Reynolds number flame. Generally the agreement is excellent. Author (GRA)

N81-33252# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
ELECTROCHEMICAL INVESTIGATIONS OF NOVEL ELECTRODE MATERIALS Progress Report, 1 Nov. 1980 - 31 Oct. 1981
Wayne L. Worrell Jun. 1981 9 p refs
(Contract DE-AC02-77ER-04356)
(DE81-027460; DOE/ER-04356/4) Avail: NTIS HC A02/MF A01

The structural and electrochemical properties of the unexplored lithium co-intercalated TiS2 compounds was determined. Progress is discussed: preparation of lithium co-intercalated TiS2 compounds; structural characterization; and electrochemical cell investigations. DOE

N81-33253# Texas A&M Univ., College Station. Dept. of Chemistry.
HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY/ VIDEO FLUOROMETRY. PART 1: INSTRUMENTATION
Michael P. Fogarty, Dennis C. Shelly, and Isiah M. Warner 1981 31 p refs Sponsored in part by Upjohn Co.
(Contract DE-AS05-80EV-10404; NR Proj. 051-747)
(DE81-028428; DOE/EV-10404/T2) Avail: NTIS HC A03/MF A01

A rapid scanning, two dimensional fluorometer was used to obtain Emission-Excitation Matrices (EEMs) of the effluent of an HPLC. These spectra, obtained on the fly, provide qualitative as well as quantitative information about unknown samples. An in depth discussion of the instrumentation developed as well as data processing alternatives is presented. DOE

N81-33254# Texas A&M Univ., College Station. Dept. of Chemistry.
HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY/ VIDEO FLUOROMETRY. PART 2: APPLICATIONS
Dennis C. Shelly, Michael P. Fogarty, and Isiah H. Warner 1981 35 p refs Sponsored in part by Upjohn Co.
(Contract DE-AS05-80EV-10404; NR Proj. 051-747)
(DE81-028458; DOE/EV-10404/T3-Pt-2) Avail: NTIS HC A03/MF A01

A Video Fluorometer is used as a detector for high performance liquid chromatography to characterize highly complex samples. Data selection and evaluation techniques are discussed so as to sped the spectral identification process. Several well known polynuclear aromatic hydrocarbons are found in the samples. DOE

N81-33255# Aerojet Energy Conservation Co., Sacramento, Calif.
COMBUSTION ENHANCEMENT AND POLLUTANT CONTROL RESEARCH WITH ACOUSTICALLY INDUCED MIXING Technical Progress Report, Mar. - Jun. 1981
R. J. Faeser and M. I. Rudnicki Jul. 1981 22 p refs
(Contract DE-AC22-81PC-40270)
(DE81-027016; DOE/PC-40270/1) Avail: NTIS HC A02/MF A01

An experimental research program was initiated to evaluate the possibility that beneficial effects can result when acoustic energy is impressed on the combustion zone of pulverized coal furnaces. Those benefits include the reduction in NO/sub x/ generation, the increase in combustion intensity, and the increase in turndown ratio (maximum flow/minimum flow). The postulated reason for these possible benefits is the fine stirring action of high frequency acoustic waves. The first three month period of this program was devoted to the formulation of a test plan, the design of the 5 lb/hr coal rate combustor with acoustic driver attachments, and the specification of the test facility. DOE

N81-33256# California Univ., Livermore. Lawrence Livermore Lab.
DEGRADATION OF THE MOLECULAR WEIGHT AND NITRATE ESTER CONTENT OF CELLULOSE NITRATE ON THERMAL AGING
H. R. Leider and A. J. Pane Jun. 1981 11 p refs
(Contract W-7405-eng-48)
(DE81-029875; UCRL-53163) Avail: NTIS HC A02/MF A01

Changes in molecular weight and nitrate ester content for cellulose nitrate (NC), either pure or as a constituent of PBX-5404, were determined as a function of time and temperature. Changes in the number averaged molecular weight, M sub n, are described by the simple theory of random chain scission, and M sub n is found to correlate well with nitrate ester loss. Significant differences are seen between NC aged in the isolated condition and aged as the binder in PBX-9404. DOE

N81-33257# California Univ., Livermore. Lawrence Livermore Lab. Materials and Molecular Research Div.
MECHANISM AND KINETICS OF FISCHER-TROPSCH

SYNTHESIS OVER SUGGESTED RUTHENIUM CATALYSTS Ph.D. Thesis
Carl Stephen Kellner Jun. 1981 193 p refs
(Contract W-7405-eng-48)
(DE81-025158; LBL-12278) Avail: NTIS HC A09/MF A01

The kinetics of the Fischer-Tropsch synthesis of hydrocarbons, methanol, and acetaldehyde, over alumina and silica supported ruthenium catalysts were investigated over a broad range of reaction conditions. Mechanisms for the formation of normal paraffins, alpha olefins, methanol, and acetaldehyde were proposed. Rate data were obtained between 448 and 548 K, 1 and 10 atm, and H2/CO ratios between 1 and 3, utilizing a microflow reactor operated at very low conversions. In addition to the studies performed with H2/CO mixtures, a series of experiments were carried out utilizing D2/CO mixtures. These studies were used to help identify rate limited steps and steps that were at equilibrium. DOE

N81-33258# Occidental Research Corp., Irvine, Calif.
CONTROLLED FLASH PYROLYSIS Quarterly Technical Progress Report, Jan. - Mar. 1981
K. Durai-Swamy, S. C. Che, C. B. Chen, R. Jain, S. S. Kim, and H. VonSchonfeldt Apr. 1981 31 p refs
(Contract DE-AC22-80PC-30264)
(DE81-024384; DOE/PC-30264/06; QTPR-2) Avail: NTIS HC A03/MF A01

Six baseline tests were made in the Controlled Flash Pyrolysis unit with a coal feed rate of about 2 kg/h. Preliminary material balance and yield data for these tests are presented. A laboratory scale (1 gm/min.) reactor was set up to get once through pyrolysis data. Free radical studies on coal pyrolysis began using an Electron Spin Resonance spectrometer. DOE

N81-33259# UOP, Inc., Des Plaines, Ill.
GEOTHERMAL HYDROGEN SULFIDE REMOVAL
P. Urban Apr. 1981 56 p refs
(Contract DE-AC03-79ET-27203)
(DE81-023938; DOE/ET-27203/1) Avail: NTIS HC A04/MF A01

UOP Sulfox technology successfully removed 500 ppM hydrogen sulfide from simulated mixed phase geothermal waters. The Sulfox process involves air oxidation of hydrogen sulfide using a fixed catalyst bed. The catalyst activity remained stable throughout the life of the program. The product stream composition was selected by controlling pH; low pH favored elemental sulfur, while high pH favored water soluble sulfate and thiosulfate. Operation with liquid water present assured full catalytic activity. Dissolved salts reduced catalyst activity somewhat. Application of Sulfox technology to geothermal waters resulted in a straightforward process. There were no requirements for auxiliary processes such as a chemical plant. Application of the process to various types of geothermal waters is discussed and plans for a field test pilot plant and a schedule for commercialization are outlined. DOE

N81-33260# Sandia Labs., Albuquerque, N. Mex.
SHOCK-INDUCED INORGANIC CHEMISTRY
B. Morosin and R. A. Graham 1981 10 p refs Presented at the Conf. on Shock Waves in a Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024082; SAND-81-1455C; CONF-810684-10) Avail: NTIS HC A02/MF A01

The fundamentals of chemical processes occurring in shock compressed inorganic materials was reviewed. The materials survey presented complements previous reviews on this topic and examines specific topics from a different perspective. Future directions for research in this area are suggested. DOE

N81-33261# Sandia Labs., Albuquerque, N. Mex.
APPLICATIONS OF FOURIER TRANSFORM INFRARED SPECTROSCOPY TO IN SITU CATALYST SURFACE STUDIES
David M. Haaland and Frank L. Williams (New Mexico Univ., Albuquerque) 1981 3 p Presented at the Intern. Conf. on Fourier Transform Infrared Spectroscopy, Columbia, S.C., 8 Jun. 1981
(DE81-023180; SAND-80-2594C; CONF-810666-1) Avail: NTIS HC A02/MF A01

Fourier transform infrared spectroscopy (FTIR) is a powerful tool for studying surface species present on supported catalysts during normal reaction conditions of high-temperature and/or pressure. A special high throughput optical bench was used to optimize the sensitivity of this system for high optical density catalyst samples. The infrared cell is designed to operate at high vacuum for adsorption studies or as a recycle flow reactor. Improvements in spectral subtractions were obtained by the precise repositioning of samples in the ir beam. The enhanced performance resulting from these modifications was instrumental in improving the sensitivity for infrared surface studies of the reactions C6H6 + 3H2 reversible C6H12 and 2CO + O2 yields 2CO2 over a Pt/Al2O3 catalyst. The bonding and geometry of benzene chemisorbed on the Pt surface was determined from the infrared spectra. Simultaneous reaction rate and surface coverage measurements was also made during CO oxidation on Pt/Al2O3. Hysteresis effects in both reaction rate, and CO surface coverage are observed. The ir spectra indicate that islands of CO form on the Pt surface during reaction. DOE

N81-33262# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Reseach Div.
TREATMENT OF IONIC SOLUTIONS OVER THE ENTIRE MISCIBILITY RANGE
Kenneth S. Pitzer May 1981 33 p refs Presented at the Ann. Meeting of the Bunsen Gesellschaft fuer Phys. Chem., Marburg, West Germany, 29-30 May 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE81-023029; LBL-12761; CONF-810589-1) Avail: NTIS HC A03/MF A01

Conductance and thermodynamic properties are considered for several ionic systems continuously miscible from the fused salt to dilute solution in water or another polar solvent. Over most of the composition range, the activities of the respective components of the ionic systems show the same patterns of behavior and can be represented by the same equations that were developed for nonelectrolytes. Consideration is also given to ionic systems of large but finite solubility including mixed electrolytes. The dominant factor in the behavior of these systems is the strength of ion solvation in competition with intermolecular forces in the solvent and direct interionic forces. Strong ion solvation yields negative deviations from ideal solution behavior and vice versa. DOE

N81-33263# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
APPLICATION OF THE ENGULFMENT, COHERENCE INTERDIFFUSION, MOVING OBSERVER (ESCIMO) THEORY OF TURBULENT COMBUSTION Ph.D. Thesis - London Univ.
Mahmoud Abd El-Rasheed Noseir Mar. 1980 352 p refs
(HTS/80/5) Avail: NTIS HC A16/MF A01

A biographic and demographic theory of turbulent combustion is presented and evaluated. The biographic (Lagrangian) aspect within individual folds (eddies) which are formed at various points in a turbulent reacting flow, is studied by the interdiffusion and reaction phenomena within stretched fluid folds. A simplified demographic (Eulerian) analysis, based on the top-hat profile assumption, is made, and is combined with the biographic calculation to predict premixed, confined, baffle stabilized flames. It is found that the internal flame propagation scheme agree well with experimental results, showing that simplified biographic analysis, using an algebraic equation can be applied. Self-ignition and internal flame propagation schemes are compared.
Author (ESA)

N81-33264# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
SOURCES OF HALOGENATED HYDROCARBONS IN AN URBAN WATER SUPPLY Final Report, 1 May 1976 - 15 Jan. 1980
J. V. Hunter and T. Sabatino May 1981 106 p refs
(Grant EPA-R-804394)
(PB81-208191; EPA-600/2-81-089) Avail: NTIS HC A06/MF A01 CSCL 07D

The distribution and concentration of both low and high

boiling halogenated hydrocarbons and halogenated pesticides were determined in the following surveys: general stream survey; sewage treatment plant effluent survey; industrial waste treatment plant effluent survey; source, finished and delivered drinking water survey. Intensive sampling programs centered around the variation of halogenated material contained in both raw and finished drinking water. It was observed that resulting halogenated hydrocarbon concentrations varied to a greater extent when a smaller sampling period was employed. GRA

N81-33265# National Bureau of Standards, Washington, D.C. National Measurement Lab.
ANALYSIS OF THE SHAPE OF THE FAR-INFRARED SPECTRA OF H2-H2 AND H2-He COLLISIONS
E. Richard Cohen (Rockwell International, Thousand Oaks, Calif.) and George Birnbaum Apr. 1981 28 p refs Sponsored in part by JPL, Pasadena, Calif.
(PB81-210395; NBSIR-80-2175) Avail: NTIS HC A03/MF A01 CSCL 07D

The spectra were previously measured in the range 20 to 900/cm at -77.4, 194.7 and 292.4 K. These spectra were fitted with a semi-empirical line shape and the parameters in the shape function were evaluated. The accuracy of these fittings is discussed. The zeroth and first spectral moments for the isotropic overlap translational spectrum due to H2-He collisions were obtained and given a value for the range parameter in the induced-dipole function in good agreement with that given by an ab initio calculation. GRA

N81-33266# National Bureau of Standards, Boulder, Colo. Center for Chemical Engineering.
SELECTED PROPERTIES OF HYDROGEN (ENGINEERING DESIGN DATA) Final Report
R. D. McCarty, J. Hord, ed., and H. M. Roder Feb. 1981 525 p refs
(PB81-211492; NBS-MN-168; LC-80-600195) Avail: NTIS HC A22/MF A01 CSCL 07D

Data on hydrogen properties research are presented. Thermophysical properties of liquid, liquid vapor, vaporous, and gaseous hydrogen are presented and the solid-liquid, solid vapor, and solid phase properties are compiled. Ortho para modifications of the hydrogen molecule and attendant property variations are considered. Combustion and safety data, pertinent to hazard analysis of hydrogen systems, and miscellaneous properties are collected. Data figures, data tables, and symbols, units, and conversion factors are summarized. GRA

N81-33267# UOP, Inc., San Diego, Calif.
RESEARCH AND DEVELOPMENT ON A SPIRAL WOUND MEMBRANE SYSTEM FOR SINGLE STAGE SEAWATER DESALINATION Final Report, 1 Oct. 1979 - 31 Mar. 1981
R. L. Riley and C. E. Milstead 30 Apr. 1981 255 p refs
(Contract DI-14-34-0001-9529)
(PB81-213191; W81-03333; OWRT-C-90277-D(9529)(1)) Avail: NTIS HC A12/MF A01 CSCL 07D

The objective of single stage seawater desalination by reverse osmosis was achieved by the development of a thin firm composite poly (ether/urea) membrane, designated TFC-801. This membrane typically exhibits 99.4% rejection with a product flux of 13 to 15 gal/ft - day operating on seawater at 800 psi applied pressure. A limitation, however, is the membrane's sensitivity to chlorinated feeds. Investigations of the effects on TFC membrane system to various sterilizing agents; biocides, clearing agents, surfactants, and coagulating agents were conducted, both in the laboratory and in long term field tests on 4 and 6 in. diameter spiral wound elements. GRA

N81-33268# National Bureau of Standards, Washington, D.C. National Engineering Lab.
A COMPUTER PROGRAM FOR THE PREDICTION OF VISCOSITY AND THERMAL CONDUCTIVITY IN HYDROCARBON MIXTURES
James F. Ely and H. J. M. Hanley Apr. 1981 80 p refs
(PB81-214165; NBS-TN-1039) Avail: NTIS HC A05/MF A01 CSCL 07D

The model is based on the extended corresponding states model and covers molecular weight ranges including C2O. Only pure component equilibrium data such as the critical constants are required as input to the calculation procedure--no transport data are required. Extensive comparisons with experimental data for pure fluids and binary mixtures are presented. The average percentage deviation for both the viscosity and thermal conductivity was observed to be less than 8 percent. A computer program (TRAPP) which performs the calculations reported in this manuscript is described. GRA

N81-33269# National Bureau of Standards, Washington, D.C. Center for Fire Research.
WILL THE SECOND ITEM IGNITE? Final Report
Vytenis Babrauskas May 1981 34 p refs Sponsored in part by Veterans Administration
(PB81-214025; NBSIR-81-2271) Avail: NTIS HC A04/MF A01 CSCL 13M

Multiple item burning in room fires is discussed. The radiant heat fluxes from burning first-to-ignite objects were measured, along with their mass loss rates. The ignitability of exposed objects was determined using a bench-scale uniform flux ignitability test. It is suggested that whether a second item will ignite can best be determined analytically from considering these two sets of results. GRA

N81-33270# Science Applications, Inc., Canoga Park, Calif. Combustion Science and Advanced Technology Dept.
PERFORMANCE MODELING OF ADVANCED GAS BURNER SYSTEMS: CATALOGUE OF EXISTING INTERCHANGEABILITY METHODS Final Report
P. T. Harsha, R. B. Edelman, and D. H. France 1980 132 p refs Sponsored by Gas Research Inst.
(PB81-217622; SAI-80-024-CP; GRI-80/0021) Avail: NTIS HC A07/MF A01 CSCL 21B

The catalogue includes worked examples to illustrate the application of each of the approaches. It was assembled both to provide an up to date compilation of interchangeability methods and to provide the foundation for the establishment of the basic phenomena involved in both interchangeability and fuel effects on gas utilization in general. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N81-33271 Materials Research Labs., Melbourne (Australia).
SURVEY OF NICKEL-ALUMINUM-BRONZE CASTING ALLOYS ON MARINE APPLICATIONS
G. M. Weston Apr. 1981 33 p refs
(MRL-R-807; AR-002-405; NAV-98/115) Copyright. Avail: Source: Materials Res. Labs., P.O. Box 50, Ascot Vale, Vic. 3032

The structure and corrosion performance of nickel-aluminum bronze (NAB) covered by naval specification were investigated. No evidence was found to suggest that there would be any significant difference in corrosion performance between alloys meeting the two specifications. Early corrosion problems associated with the weld repair areas of castings were overcome largely by using improved foundry and welding techniques followed by a heat treatment procedure. Both crevice and pit corrosion still occur in operating systems. Results indicate that with improved NAB foundary practice this is less widespread, with penetration often being confined to the surface grains. R.C.T.

N81-33272*# Battelle Columbus Labs., Ohio.
QUANTUM CHEMICAL CALCULATION OF THE EQUILIBRIUM STRUCTURES OF, SMALL METAL ATOM CLUSTERS Semiannual Progress Report, 15 Apr. - 30 Oct. 1981
Luis R. Kahn 23 Oct. 1981 33 p refs
(Grant NsG-2027)
(NASA-CR-164874) Avail: NTIS HC A03/MF A01 CSCL 11F

The application of ab initio quantum mechanical approaches in the study of metal atom clusters requires simplifying techniques that do not compromise the reliability of the calculations. Various aspects of the implementation of the effective core potential (ECP) technique for the removal of the metal atom core electrons

from the calculation were examined. The ECP molecular integral formulae were modified to bring out the shell characteristics as a first step towards fulfilling the increasing need to speed up the computation of the ECP integrals. Work on the relationships among the derivatives of the molecular integrals that extends some of the techniques pioneered by Komornicki for the calculation of the gradients of the electronic energy was completed and a formulation of the ECP approach that quite naturally unifies the various state-of-the-art 'shape- and Hamiltonian-consistent' techniques was discovered. A.R.H.

N81-33273*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A NEW DIFFUSION-INHIBITED OXIDATION-RESISTANT COATING FOR SUPERALLOYS
Michael A. Gedwill, Thomas K. Glasgow, and Stanley R. Levine Aug. 1981 21 p refs
(NASA-TM-82687; E-968) Avail: NTIS HC A02/MF A01 CSCL 11F

A concept for enhanced protection of superalloys consists of adding an oxidation- and diffusion-resistant cermet layer between the superalloy and the outer oxidation-resistant metallic alloy coating. Such a duplex coating was compared with a physical-vapor-deposited (PVD) NiCrAlY coating in cyclic oxidation at 1150 C. The substrate alloy was MA 754 - an oxide-dispersion-strengthened superalloy that is difficult to coat. The duplex coating, applied by plasma spraying, outperformed the PVD coating on the basis of weight change and both macroscopic and metallographic observations. Author

N81-33274# Materials Research Labs., Ascot Vale (Australia).
SURFACE MODIFICATION CONCEPTS FOR ENHANCEMENT OF THE HIGH-TEMPERATURE CORROSION RESISTANCE OF GAS TURBINE SUPERALLOYS
Noel A. Burley Dec. 1980 46 p refs
(AD-A103419; MRL-R-798; AR-002-382) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report summarizes the current view of the mechanisms of the phenomenon of hot corrosion, whereby the surface integrity of gas turbine superalloys is degraded, and also the principal types of protective coating applied to aerofoil components made of these materials to inhibit hot corrosion and extend their useful lives. A concept is presented that the high-temperature corrosion resistance of superalloys can be significantly enhanced by selective modification of the composition and structure of their para-surface zones, utilizing new methods of surface treatment such as ion implantation, laser alloying, and thermal passivation. Author (GRA)

N81-33275# Materials Research Labs., Ascot Vale (Australia).
DESULPHURIZATION OF LOW-ALLOY STEEL IN A DIRECT CURRENT ESR FURNACE
Richard C. Andrew and George M. Weston Apr. 1981 21 p refs
(AD-A103420; MRL-R-806) Avail: NTIS HC A02/MF A01 CSCL 11/6

Eleven small ingots (70 mm diameter, 500 mm long) were produced in an experimental electroslag-refining furnace using electrode negative and electrode positive direct current power modes to enable the extent of desulphurization to be compared. The electrode material was a commercial low alloy steel (En 25) containing about 0.03 wt% sulphur. The average sulphur reduction determined for each ingot was found to increase as the ingress of oxygen to the molten slag was reduced, and extensive desulphurization was achieved with both power modes provided the entry of oxygen to the slag bath was sufficiently restricted. Slightly lower levels of sulphur removal were recorded for the electrode positive power mode, but whether this was due solely to electrochemical reactions or to the asymmetric pattern of heat generation is uncertain. Author (GRA)

N81-33276# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
DETERMINATION OF THE TRANSVERSE PROPERTIES OF TEXTURED ESR 4340 STEEL Final Report, 13 May 1980 - 24 Feb. 1981
John T. Berry May 1981 43 p refs
(Contract DAAG46-80-C-0043; DA Proj. 1L6-12105-AH-84) (AD-A103203; AMMRC-TR-81-19) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objective of the current investigation was to determine the transverse properties of electroslag remelted AISI 4340 which had been processed to produce an intense (112) + (111) type texture. The material was processed from 10 inch (250 mm) x 5.0 inch (125 mm) x 5.0 inch (125 mm) thick slabs to approximately 0.5 inch (12.5 mm) thick plate in a two high rolling mill to produce the above texture. Utilizing the double ligament test; long transverse, short transverse, longitudinal and diagonal mechanical properties were determined. The results of the tests indicate that some anisotropy does exist in the plane of the plate. The associated levels of longitudinal yield stress and ultimate stress are considerably higher than those of a non-textured material of corresponding longitudinal ductility and hardness level (approx. H sub RC 57). The long transverse and short transverse ductilities are, however, lower than those of the non-textured material. In the case of the short transverse properties, both inferior strength and ductility were observed. The associated scanning electron microscopy showed the presence of minute flattened strip-like MnS inclusions on the macroscopically flat or terrace type fracture surfaces associated with the low ductility short transverse specimens. All of the specimens concerned with this orientation broke at stresses below the level of general yielding. Author (GRA)

N81-33277# Illinois Univ. at Urbana-Champaign. Dept. of Metallurgy and Mining Engineering.
PHASE INSTABILITY DURING FATIGUE OF STAINLESS STEEL Final Report, 10 Jul. 1976 - 31 Aug. 1980
Carl J. Altstetter, Zafar Khan, and Gary Schuster Jan. 1981 11 p refs
(Grant DAAG29-76-G-0278)
(AD-A103574) Avail: NTIS HC A02/MF A01 CSCL 11/6

This work is a comparative study of the fatigue crack growth rate (FCGR) of two austenitic stainless steels, AISI 301 and AISI 302. The objective was to determine how differences in the austenitic stabilities of the two steels would effect their respective FCGR's. Tests were run in argon, hydrogen, and a smaller number in air. In addition to determining the FCGR's, a number of other quantities were also measured using various techniques. The plastic zone size of some specimens was determined by using a microhardness tester and electron channeling data. The residual stress around the crack tip was measured using strain gages. The volume fraction of martensite was determined by measuring the magnetic permeability and by using quantitative metallography. The phase present along the path of the fatigue crack was determined by using glancing incidence electron diffraction. Results from the work show that the relatively unstable AISI 301 stainless steel has a FCGR approximately 50% lower than AISI 302 stainless steel when tested in argon or air at a low mean stress, less than 66 MPa. At higher mean stresses the FCGR's are equal. The plastic zone sizes of AISI 301 specimens are generally smaller than for AISI 302. The cause for the lower FCGR observed in the AISI 301 seems to be the residual compressive stresses that develop around the crack tip as a result of the martensite formation. Testing in hydrogen caused the FCGR of both steels to greatly increase with the AISI 301 being affected to a much larger extent. GRA

N81-33278# Fulmer Research Inst. Ltd., Stoke Poges (England).
CHARACTERIZATION OF URANIUM 3/4% TITANIUM ALLOYS EXTRUDED FROM THE GAMMA PHASE Final Technical Report
R. I. Saunderson and G. B. Brook Jun. 1981 53 p refs
(Contract DAJA37-79-C-0100; DA Proj. 1T1-61102-BH-57)
(AD-A103807; R812/4) Avail: NTIS HC A04/MF A01 CSCL 11/6

High density and tensile properties can be achieved in U-3/4% Ti by water quenching from the gamma phase and subsequently aging at lower temperature. These high quench rates have been found to give rise to centreline cracking and void formation in medium and large diameter bars (i.e., greater than approximately 20mm diameter). The effects of quench rate, mode of quenching and subsequent aging treatments on microstructure and properties of a U-3/4 wt% Ti alloy have been investigated. Particular emphasis has been placed upon heat treatment of

35mm diameter, gamma-extruded, bar. Cooling rates in the range 2 480/ks were obtained, resulting in a wide spectrum of microstructures ranging from granular alpha after slow rates of cooling to almost fully martensitic alpha prime after faster cooling. By optimising the rate and mode of quenching the problems of centreline cracking and void formation have been circumvented. Even at the fastest cooling rates only approximately half to three-quarters of the available titanium was retained in solution. Nevertheless, subsequent aging at 450 C produced hardnesses in excess of 480 Hv sub 30 due to precipitation of U2 Ti. GRA

N81-33279# Naval Postgraduate School, Monterey, Calif.
EFFECT OF THERMOMECHANICAL TREATMENT ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AISI 52100 STEEL M.S. Thesis
Clarence W. Schultz Jun. 1981 103 p refs
(AD-A104125) Avail: NTIS HC A06/MF A01 CSCL 11/6

The effects of various thermo-mechanical treatments on the microstructure and mechanical properties of AISI 52100 steel have been investigated using a combination of optical and transmission electron microscopy in conjunction with standard mechanical testing. The response of the as-treated material to various hardening and tempering treatments has been determined and compared to that of material processed using a standard commercial technique. The results indicate that the thermo-mechanical treatments examined refine the microstructure and increase the tensile strength of AISI 52100 steel. Using these treatments allows processing of the steel to be accomplished at lower austenitizing temperatures and in shorter times than in currently utilized techniques. Additionally, the degradation of mechanical properties by time at various tempering temperatures is reduced. Author (GRA)

N81-33280# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
A CONSTITUTIVE REPRESENTATION FOR IN 100 Final Report, Sep. 1978 - Jan. 1981
D. C. Stouffer Wright-Patterson AFB, Ohio AFWAL Jun. 1981 37 p refs
(Contract F33615-78-C-5199; AF Proj. 2307)
(AD-A104153; AFWAL-TR-81-4039) Avail: NTIS HC A03/MF A01 CSCL 11/6

The mechanical response of IN100 at 732 C (1350 F) is calculated using the state variable constitutive equation of Bodner and Partom. The model is based on the concept that the inelastic component of the strain rate is non-zero for all non-zero values of stress and that separate loading and unloading conditions are not required. The plastic strain rate separate loading and unloading conditions are not required. The plastic strain rate depends on a state variable that describes the resistance to plastic flow. In this report, it is demonstrated that the coefficients in evolution equation for the state variable can be determined from a systematic analysis of tensile and creep data. The model is used to predict the stress relaxation and cyclic response of the material. Author (GRA)

N81-33281# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
AN AMORPHOUS ALLOY STRENGTHENED WITH A DISPERSION OF SECOND PHASE PARTICLES
H. Kimura, B. Cunningham, and D. G. Ast 24 Aug. 1981 5 p refs Sponsored in part by Cornell Univ.
(Contract N00014-77-C-0546; NR Proj. 039-151)
(AD-A103908; TR-6) Avail: NTIS HC A02/MF A01 CSCL 11/2

A Fe based metallic glass has been prepared with WC particles as a second phase, improving the yield strength. Author (GRA)

N81-33282# Battelle Pacific Northwest Labs., Richland, Wash.
CORROSION RESISTANCE OF CAST IRONS AND TITANIUM ALLOYS AS REFERENCE ENGINEERED METAL BARRIERS FOR USE IN BASALT GEOLOGIC STORAGE: A LITERATURE ASSESSMENT
L. A. Charlot and R. E. Weterman Jul. 1981 72 p refs Prepared for Rockwell International Corp., Richland, Wash.
(Contract DE-AC06-76RL-01830)
(DE81-026840; PNL-3569) Avail: NTIS HC A04/MF A01

A survey and assessment of the literature on the corrosion resistance of cast irons and low alloy titanium are presented. Selected engineering properties of cast iron and titanium are briefly described; however, the corrosion resistance of cast iron and titanium in aqueous solutions or in soils and their use in a basalt repository are emphasized. In evaluating the potential use of cast iron and titanium as structural barrier materials for long-lived nuclear waste packages, it is assumed that titanium has the general corrosion resistance to be used in relatively thin cross sections whereas the cost and availability of cast iron allows its use even in very thick cross sections. The survey showed that the uniform corrosion of low alloy titanium in a basalt environment is expected to be extremely low. DOE

N81-33283# Battelle Pacific Northwest Labs., Richland, Wash. Dept. of Materials Science and Engineering.
RESEARCH ON MECHANISMS OF STRESS CORROSION CRACKING IN ZIRCALOY
D. B. Knorr and R. M. Pelloux Jun. 1981 78 p refs Sponsored in part by Consumer Power Co. and Exxon Nuclear Co., Inc.
(Contracts DE-AC06-76RL-01830; DE-AC02-76ET-34215)
(DE81-028280; DOE/ET-34215/24; PNL-3860) Avail: NTIS HC A05/MF A01

The results of internal gas pressurization tests, primarily of 3200 C, on cladding tubes from two suppliers, Supplier A and Supplier B, are presented. The two lots show a substantial difference in iodine susceptibility so a test matrix is used to resolve the relative contributions of surface condition, residual stress, and texture. Additional tests with constant deflection split ring specimens and with unstressed cladding segments are used to understand crack initiation and the early crack growth stages of SCC. The difference in SCC susceptibility is due to crystallographic texture. Other variables such as surface finish, stress relief temperature, and residual stress have little or no effect. Mechanical properties, crack initiation, and crack propagation all depend on texture. Both initiation and propagation features are analyzed by scanning electron microscopy. A mechanism for crack initiation consistent with most observations in this study and with the work of other investigators is proposed. At 3200 C, lifetime is crack initiation limited while several tests at 3900 C indicate that lifetime is less initiation limited at higher temperature. DOE

N81-33284# Knolls Atomic Power Lab., Schenectady, N. Y.
HEAT-TREATMENT PARAMETERS FOR THE AGING OF ALLOY 625
S. C. Hayes Sep. 1981 52 p refs
(Contract DE-AC12-76SN-00052)
(DE81-030005; KAPL-4143) Avail: NTIS HC A04/MF A01

A set of heat treatment parameters were determined for the aging of Alloy 625 to a minimum yield strength of 100 ksi. The Box-Hunter technique of response surface analysis was employed to determine the relationship of the yield strength to the five heat treatment parameters which include: the anneal/solution treatment temperature; the nucleation treatment temperature and time; and the final aging temperature and time. It was found that Alloy 625 has a high niobium/carbon ratio and has been hot finished to retain massive precipitated carbides can be aged to a minimum yield strength of 100 ksi in as little as 20 hr at 12000 F. The tensile properties of aged material were measured at temperatures to 7000 F, and the thermal stability was confirmed by exposure for 10,000 hr in 6000 F air with no change in room temperature tensile properties. DOE

N81-33285# Oak Ridge National Lab., Tenn.
EFFECT OF MICROSTRUCTURE ON THE SUSCEPTIBILITY OF LOW-ALLOY STEELS TO HYDROGEN ATTACK
R. O. Williams Aug. 1981 52 p refs
(Contract W-7405-eng-26)
(DE81-028030; ORNL-5781) Avail: NTIS HC A04/MF A01

In an alloy steel in which one or more alloy additions stabilize the carbide phase, the carbon activity depends on the microstructure and the prior thermal history. The carbon activity is a major factor in the susceptibility of such steels to form internal methane bubbles when heated in high pressure hydrogen. To verify the susceptibility to hydrogen attack of a given steel by its prior treatment, the equilibrium carbon activity when the steel is in internal equilibrium must be calculated. Analysis of the rate of coarsening of carbides in such steels shows that this rate is enhanced by a fine carbide dispersion which is desirable for the

maximum strength. A computer program is included for calculating the free energy and the activities of each component for alloys having up to 13 components and forming a liquid, bcc, fcc, or hoxagonal close packed solid solution. DOE

N81-33286# Sandia Labs., Albuquerque, N. Mex.
COMPOCASTING OF AN ALUMINUM ALLOY COMPOSITE CONTAINING B SUB 4C PARTICULATE
F. M. Hosking Jul. 1981 30 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028185; SAND-81-0976) Avail: NTIS HC A03/MF A01

A description of the compocasting process is given. Processing of metal matrix composites through the additions of nonmetallic particulate into a partially solidified, vigorously agitated metallic slurry is the key feature of the technique. This investigation is specifically directed at the fabrication of an aluminum -4 weight percent magnesium alloy containing uniform dispersions of boron carbide. The boron cabide impacts a dual property to the composite. It has high hardness and the ability to absorb neutrons. DOE

N81-33287# Ames Lab., Iowa.
THERMODYNAMICS AND PHASE EQUILIBRIA IN THE BINARY SYSTEMS OF VANADIUM WITH IV B ELEMENTS
J. F. Smith 1981 14 p refs Presented at 110th Ann. Meeting of the AIME, Chicago, 22 Feb. 1981
(Contract W-7405-eng-82)
(DE81-023790; IS-M-319; CONF-810203-14) Avail: NTIS HC A02/MF A01

A survey of available data for binary vanadium systems with Group IV B elements shows that the number of intermediate phases tends to decrease with increasing atomic number of the IV B element. Four intermediate phases have been found in the V-Si and V-Ge systems, two in the V-Sn system, and none in the pure V-Pb system at ambient pressure. In three instances out of four, the stoichiometries of the phases in the V-Si system become successively more rich in vanadium as silicon is replaced first by vanadium and then by tin, and phase stability ceases for the two central stoichiometries when tin replaces silicon and for all stoichiometries when lead replaces silicon. This indication of decreasing phase stability with increasing atomic number of the IV B element is confirmed by successively less negative enthalpies of phase formation in the sequence V-Si, V-Ge, and V-Sn. DOE

N81-33288# Idaho National Engineering Lab., Idaho Falls.
SURFACE FINISH EFFECTS ON THE HIGH-CYCLE FATIGUE ALLOY 718
G. E. Korth 1981 35 p refs Presented at Meeting on the Effects of Residual Stresses on Fatigue, Phoenix, Ariz., 11 May 1981
(Contract DE-AC07-76ID-01570)
(DE81-024591; EGG-M-01981; CONF-810591-1) Avail: NTIS HC A03/MF A01

Load control high cycle fatigue tests at 427 and 649 C were conducted on Alloy 718 specimens given various surface finishes. The standard surface preparation for fatigue specimens involves a low stress grind to minimize the residual surface stresses. A low stress grind surface was used for generating baseline data; various other surfaces that could be considered feasible for large components fabricated in commercial shops were produced on test specimens, and the high cycle fatigue strength of each was compared. Surface finishes produced by belt sanding, grit blasting, fine machining, and electropolishing were examined. Surface roughness measurements were taken on typical specimens with each surface finish, and residual stress profiles were measured on three of the surface types. Results show little or no difference in fatigue life for the various surfaces and indicate that residual stress profile and grain size are more important factors than surface roughness in determining high cycle fatigue strength. DOE

N81-33289# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THE RECLAMATION OF PARTS THAT HAVE BEEN EMBRITTLED BY CADMIUM ELECTROPLATING IN A BATH WITH A BADLY CONTROLLED COMPOSITION
H. P. vanLeeuwen Jul. 1979 28 p refs In FRENCH; ENGLISH summary
(NLR-MP-79032-U) Avail: NTIS HC A03/MF A01

Steel specimens (AISI 4340) were manufactured and cadmium plated under laboratory supervision. Plating conditions were controlled regarding hydrogen embrittlemant by electroplating in a cyanide bath. Three reclamation procedures were investigated. The specimens were then subjected to a series of mechanical tests. Results show that an extended baking treatment with or without stripping the part cannot remove all traces of embrittlement due to faulty plating. However, if stripped and baked parts are replated in a bath with a closely controlled composition, which is checked regularly with a Lawrence gage, the threshold stresses for delayed failure are raised to such a level that it ought to be possible to limit stresses in service to levels well below the thresholds. Author (ESA)

N81-33290# Heraeus (W. C.) G.m.b.H., Hanau (West Germany). Unternehmensbereich Metalle und Chemie.
DEVELOPMENT OF METHODS TO INVESTIGATE CORROSIVE AND TRIBOCHEMICAL TARNISHING REACTIONS ON METALLIC MATERIALS Final Report
Helmut Becker and Richard Schnabl Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 98 p rsfs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-170; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,60

Methods for the controlled production of tarnish layers on noble metals are presented. Accelerated corrosion tests with one, two and three corrosive gas components are depicted and compared to long-term field tests at several industrial sites. Different methods were used to investigate the tarnish layers. The composition of the tarnish layers were analyzed by surface analytical methods, such as Auger electron spectroscopy (AES), secondary ion mass spectroscopy and electron spectroscopy for chemical analysis. A method was developed to quantitatively evaluate AES in-depth profiles. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N81-33291*# Alabama Univ. in Huntsville. Dept. of Chemistry.
NEW POLYMERS FOR PHASE PARTITIONING Annual Report, 1 Sep. 1980 - 31 Aug. 1981
J. Milton Harris 10 Sep. 1981 7 p refs
(Contract NAS8-33978)
(NASA-CR-161870) Avail: NTIS HC A02/MF A01 CSCL 07C

The synthesizing of several polyethylene glycols having crown ethers attached is reported. This work led to the identification of three new polymer types which promise to be more effective at selectively binding specific cell types. Work was completed on identification of chemical properties of the new polymer crowns and on development of new techniques for determination of polymer-phase composition. T.M.

N81-33292*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AVENUES AND INCENTIVES FOR COMMERCIAL USE OF A LOW-GRAVITY ENVIRONMENT
Richard L. Brown and Lowell K. Zoller Sep. 1981 21 p
(NASA-TP-1925; M-357; LA41/LA01) Avail: NTIS HC A02/MF A01 CSCL 22A

The scientific and commercial utilization of the low-g environments for materials research and for process and product development is considered. Any products of commercial interest which necessitate processing in space will probably be low volume, high value items. To encourage the commercialization of materials processing in low-g, NASA, in parallel with establishing and demonstrating the scientific/technological precepts for analyzing

and using a low-g environment, is establishing the legal and management mechanisms to share in the cost and risk of early commercial ventures, and is now working with commercial firms on a case-by basis to explore applications of this new technology to specific needs of the company. R.C.T.

N81-33293*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELATIONSHIP BETWEEN THE IDEAL TENSILE STRENGTH AND THE FRICTION PROPERTIES OF METALS IN CONTACT WITH NONMETALS AND THEMSELVES Final Report
Kazuhisa Miyoshi and Donald H. Buckley Washington NASA Sep. 1981 10 p refs
(NASA-TP-1883; E-587) Avail: NTIS HC A02/MF A01 CSCL 11H

The adhesion and friction properties of metals in contact with diamond, boron nitride, silicon carbide, manganese-zinc ferrite, and the metals themselves in vacuum was investigated. An estimate of the ideal uniaxial tensile was obtained in terms of the equilibrium surface energy, interplanar spacing of the planes perpendicular to the tensile axis, and the Young's modulus of elasticity. The coefficient of friction for metals was found to be related to the ideal tensile strength of metals. The higher the strength of the metal, the lower the coefficient of friction.A.R.H.

N81-33294# United Technologies Research Center, East Hartford, Conn.
SINTERING OF Si3N4 UNDER NITROGEN PRESSURE Final Report, Sep. 1979 - Sep. 1980
F. S. Galasso and R. D. Veltri Jun. 1981 54 p refs
(Contract DAAG46-79-C-0101)
(AD-A103269; UTRC/R81-914905-6; AMMRC-TR-81-28) Avail: NTIS HC A04/MF A01 CSCL 11/2

A previous study on contract DAAG46-78-C-0017 showed that a sintered Si3N4 dot 15Y2O3 material similar in oxidation resistance to hot-pressed si3N4 could be prepared by minimizing the Al2O3 content in the sample while maintaining high densities. This was achieved by using a high surface area SN4O2 Si3N4 powder and a high nitrogen overpressue during high temperature (1800 C) sintering. In this study attempts were made to reduce the amount of Y2O3 as well as the Al2O3 in the mixtures to improve the oxidation resistance of the samples still further, but it was found that it was more difficult to obtain high densities for these materials than it was for Si3N4 dot 15Y2O3 materials. For that reason, preliminary measurements were made on samples containing 15% Y2O3. Strength measurements on as-pressed bars which were cold isostatic pressed and sintered showed that a Si3N4, dot 15Y2O3, dot 1Al2O3 material with a modulus of rupture as high as 514 MPa (75 ksi) could be prepared. GRA

N81-33295# Northwestern Univ., Evanston, Ill. Materials Research Center.
EFFECT OF CROSSLINKING ON THE PHYSICAL PROPERTIES OF AN EXPOXY RESIN Annual Technical Report, Feb. 1980 - Jan. 1981
T. D. Chang, S. H. Carr, and J. O. Brittain 7 Aug. 1981 38 p refs
(Contract N00014-78-C-0276; NR Proj. 356-677)
(AD-A103658; ATR-3) Avail: NTIS HC A04/MF A01 CSCL 11/9

An epoxy system consisting of diglycidyl ether of butanediol, DGEB, cured with 4-4' diaminodiphenyl sulfone, DDS, has been used for a study of effect of crosslinking density on the properties of the epoxy resin. Because of the low curing rate at room temperature and the low glass-transition temperature, this system was amenable to a wide range of controlled crosslinking density. The crosslinking density was monitored by FTIR, which followed the change in concentration of the epoxy groups during the curing reaction. The density was found to increase linearly with the crosslinking density. The modulus, the upper yield point, the lower yield point, and the degree of retraction of a deformed sample all increased with the degree of crosslinking. The thermally stimulated depolarization, TSD, beta-peak was found to vary with crosslinking density, but the gamma-peak was not changed. The TSD alpha-peak was found to decrease in strength, but increased in temperature as the crosslinking density increased. This observation suggests that TSD managements are a good monitor of crosslinking density of epoxy resins, particularly near the final stage of the crosslinking reaction. GRA

N81-33296# Northwestern Univ., Evanston, Ill. Material Research Center.
EFFECT OF SUB-T (G) AGING ON THE PHYSICAL PROPERTIES OF A FULLY CURED EPOXY RESIN Annual Technical Report, Feb. 1980 - Jan. 1981
T.-D. Chang, S. H. Carr, and J. O. Brittain 7 Aug. 1981 38 p refs
(Contract N00014-78-C-0276; NR Proj. 356-677)
(AD-A103659; ATR-4) Avail: NTIS HC A03/MF A01 CSCL 11/9

The effect of sub-T (g) aging on the properties of an epoxy resin system, diglycidyl ether of butanediol, DGEB, cured with 4-4' diaminodiphenyl sulfone, DDS, has been studied. Aging was found to increase the DSC endothermic peak, the density and the upper field point, In contrast, the lower yield point was relatively unchanged. This result, together with the observation of the elimination of the DSC endothermic peak by deformation and the absence of a yield point after deformation suggested that the aging effect was eliminated by deformation. The thermally stimulated depolarization, TSD, alpha-peak was found to decrease in strength with aging time. All of the observations were best rationalized on the basis of the free volume concept.
Author (GRA)

N81-33297# Pennsylvania State Univ., University Park. Dept. of Chemistry.
PHOSPHAZENE RINGS AND HIGH POLYMERS LINKED TO TRANSITION METALS OR BIOLOGICALLY ACTIVE ORGANIC SPECIES Interim Technical Report
H. R. Allcock 20 Aug. 1981 10 p refs Submitted for publication
(Contract N00014-75-C-0685; NR Proj. 356-577)
(AD-A103526; TR-24) Avail: NTIS HC A02/MF A01 CSCL 07/3

Phosphazene high polymers are of interest as potential carrier molecules for transition metals and biologically active organic species. Small molecule phosphazene rings are models for the exploration of new synthetic methods that may be applicable to the high polymers. Five alternative routes have been developed for the linkage of transition metals to phosphazenes.
Author (GRA)

N81-33298# Pennsylvania State Univ., University Park. Dept. of Chemistry.
CONTROLLED SYNTHESIS OF ORGANIC-INORGANIC POLYMERS THAT POSSESS A BACKBONE OF PHOSPHORUS AND NITROGEN ATOMS
Harry R. Allcock 20 Aug. 1981 22 p refs Presented at the IUPAC Conf. on Macromolecules, Florence, Italy, 1980
(Contract N00014-75-C-0685; NR Proj. 356-77)
(AD-A103473; TR-21) Avail: NTIS HC A02/MF A01 CSCL 07/4

A new class of macromolecules has been synthesized based on a skeletal structure of alternating phosphorus and nitrogen atoms. The preferred synthesis routes makes use of highly reactive polymeric intermediates. Structural diversity is achieved either by changes in the nucleophile or by chemical modification of the side groups after they are attached to the backbone. A wide range of different polymers have been prepared. The role of small molecule model reactions is stressed. Author (GRA)

N81-33299# Texas Christian Univ., Fort Worth. Dept. of Chemistry.
STUDIES OF SILICON-NITROGEN-PHOSPHORUS COMPOUNDS INCLUDING A NEW SYNTHESIS OF PHOSPHAZENES Final Report, 1 Jan. 1979 - 31 May 1981
Robert H. Neilson and Patty Wisian-Neilson 11 Aug. 1981 6 p refs
(Contract DAAG29-80-C-0044; Grant DAAG29-79-G-0004)
(AD-A103532; ARO-16266.7-C) Avail: NTIS HC A02/MF A01 CSCL 07/3

This program of research has been directed toward the development of new synthesis of polyphosphazenes, particularly those with alkyl and/or aryl substituents, via the elimination of substituted silanes from N-silylphosphinimines. The synthesis

and characterization of both the new polymers and their precursors has been investigated. Author (GRA)

N81-33300# Washington State Univ., Pullman. Dept. of Physics.
FRACTO-EMISSION FROM POLYMERS Annual Technical Report, Jun. 1980 - Jun. 1981
J. Thomas Dickinson Aug. 1981 25 p refs
(Contract N00014-80-C-0213; NR Proj. 092-558)
(AD-A103373) Avail: NTIS HC A02/MF A01 CSCL 20/11

The unique emission from interfacial failure is described for fiber reinforced epoxy and polybutadiene filled with glass beads. Initial results of the determination of the mass of the positive ions, measurements of emission from Kevlar-epoxy, and a simple model for the observed decay from interfacial failure are discussed. Preliminary work including the role of cross-linking and the dependence of Fe on crack velocity are mentioned. GRA

N81-33301# SRI International Corp., Menlo Park, Calif.
DYNAMIC DEFORMATION AND FRACTURE OF PLAIN AND FILLED ELASTOMERS Final Report, Sep. 1978 - Sep. 1981
Y. M. Gupta and W. J. Murri Sep. 1981 13 p refs
(Contract N00014-78-C-0545)
(AD-A104105) Avail: NTIS HC A02/MF A01 CSCL 11/10

To quantify the high strain-rate mechanical response of plain Solithane, compression, shear, and tension experiments were performed under impact loading (microsecond time scales). Compression and tension measurements were carried out for filled Solithane containing 56.5 wt% of glass beads. The results show that the compression response (uniaxial strain) of plain Solithane is dominated by the mean stress-volume relation. The bulk modulus under impact loading is considerably higher than that determined from static measurements in the glassy state. The filled Solithane compression response can be approximated by a simple mixture theory using the Hugoniots of plain Solithane and glass. GRA

N81-33302# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
THE EFFECT OF MICROCRAZING ON FATIGUE CRACK PROPAGATION IN POLYMERS
A. Chudnovsky, A. Moet, I. Palley, and Eric Baer 29 Jul. 1981 23 p refs
(Contract N00014-75-C-0795; Grant NSF DMR-77-24952)
(AD-A104008; TR-12) Avail: NTIS HC A02/MF A01 CSCL 11/9

A generalized theory of fatigue crack propagation in polymers is outlined. The theory accounts for fatigue crack propagation through root craze extension accompanied by simultaneous dissemination of microcrazing around the crack-root craze system thereby describing a crack-craze zone (CCZ). In addition to the conventional crack length, the width of CCZ is introduced as a new internal parameter. Applying a special version of the second law of thermodynamics: the principle of minimum thermodynamic forces, these internal parameters are formally described in terms of the reciprocal thermodynamic forces. The rate of crack extension per cycle was found to depend strongly on changes in the width of CCZ. Results of the model are applied to fatigue crack propagation data in polystyrene under various loading conditions and a good description of growth rates is observed.
Author (GRA)

N81-33303# Los Alamos Scientific Lab., N. Mex.
PRODUCTION OF COPOLYMER OF KETENE AND FORMALDEHYDE WITH IONOSPHERIC RADIOACTIVE RAY
Seizo Okamura, Koichiro Hayashi, and Kikuo Fujiwara Jul. 1981 5 p Transl. into ENGLISH of Japanese Patent No. 41-17674 (Appl. no. 38-10661, 9 Mar. 1963) 5 p
(Contract W-7405-eng-36)
(DE81-027619; LA-TR-81-15) Avail: NTIS HC A02/MF A01

The method presented is different from present methods in that it creates a type of polymer completely different from monopolymers of ketene of polyoxymethylene. It achieves this by actively having a large amount of ketene polymerized with formaldehyde. DOE

N81-33304# Stanford Univ., Calif. Petroleum Research Inst.
EFFECTIVENESS OF FOAM AS A BLOCKING AGENT AT ELEVATED TEMPERATURES OVER EXTENDED PERIODS OF TIME
T. D. Wilson and S. S. Marsden Jul. 1981 45 p refs
(Contract DE-AC03-76ET-12056)
(DE81-026706; DOE/ET-12056/14) Avail: NTIS HC A03/MF A01

The ability of foaming agents to withstand elevated temperatures over extended periods of time was studied for their potential use in thermal recovery operations. Thirty-four samples were studied in a preliminary screening apparatus in which foaming ability was observed at the boiling point of water over a one week period. The sulfonate samples and some of the cations showed the best results while the nonionics showed the poorest. A second study involved the injection of slugs of water or foamer solution into an unconsolidiated sandpack followed by continuous gas injection. Temperatures ranged from room temperature to 3600 F. The slug containing foamer solution decreased gas flow rate through the sandpack significantly more than the water slug. In time the gas flow rate would increase again, but injection of more foamer would cause it to decrease to even lower levels than the previous injection. DOE

N81-33305# California Univ., Livermore. Lawrence Livermore Lab.
EVALUATION OF ORGANIC PEROXIDES AS CURING AGENTS FOR METHYLPHENYLVINYL-SILOXANE ELASTOMERS USED FOR CELLULAR SILICONE CUSHIONS
W. E. Cady, E. S. Jessop, B. M. McKinley, and A. T. Buckner 13 Apr. 1981 21 p
(Contract W-7405-eng-48)
(DE81-025121; UCRL-53124) Avail: NTIS HC A02/MF A01

Two nonvinyl-specific curing agents, TS50 and BS, and three vinyl-specific curing agents, 101XL, 10XL, and 497XL, in two gums, SE54 and L97KVB, with two temporary fillers, urea and ammonium chloride are evaluated. In both gums, the vinyl-specific catalysts produce a lower compression set than the nonvinyl specific curing agents. IN SE54 gum, 497XL and 10XL produce a softer cushion than the other catalysts. Also these two catalysts can be used in both gums with urea to produce L3223 cellular silicone. With vinyl-specific catalysts, urea and ammonium chloride produce the same load-deflection results, but urea gives a lower compression set than ammonium chloride. The two gums are quite different: L97KVB produces a much stiffer cushion with much less set than does SE54. DOE

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

N81-33306*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PRESSURE LETDOWN METHOD AND DEVICE FOR COAL CONVERSION SYSTEMS Patent Application
James M. Kendall, Sr. (JPL, California Inst. of Technology Pasadena) and John V. Walsh, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 30 Apr. 1981 18 p
(Contract NAS7-100)
(NASA-Case-NPO-15100-1; US-Patent-Appl-SN-259211) Avail: NTIS HC A02/MF A01 CSCL 21D

A pressure letdown device for a pressure dissipating system for a coal gasification reactor is described. The letdown device accepts a polyphase fluid at an entrance pressure and entrance velocity and discharges the fluid from the device at a discharge pressure substantially equal to the entrance temperature and entrance velocity. The device consists of a series of pressure letdown stages including a plurality of coaxially nested symmetrical baffles. The number of apertures or ports for each baffle plate is unique with respect to the number of apertures in each of the other baffles. The mass rate of flow for each port is a function of the area of the port, the pressure of the fluid as

applied to the port, and a common pressure ratio established across the ports. NASA

N81-33307*# Army Military Personnel Center, Alexandria, Va.
THE EFFECTS OF ORGANOSULFUR COMPOUNDS UPON THE STORAGE STABILITY OF JET A FUEL M.S. Thesis. Final Report
Frederick C. Heneman 14 Aug. 1981 87 p refs Sponsored in part by Army
(Grant NsG-3122)
(NASA-CR-164613; AD-A103486) Avail: NTIS HC A05/MF A01 CSCL 21/4

This study examined the effect of sulfur-containing compounds on the storage stability of Jet A turbine fuel. It was found that alkyl sulfides and disulfides increased the fuel's stability while all thiols and thiophene derivatives tested decreased fuel stability (increased deposit formation) at temperatures and sulfur concentrations selected. Linear Arrhenius plots of sulfur-spiked fuel samples demonstrated that deposit formation decreased with increased slope for all alkyl sulfides, alkyl disulfides, thiols, and thiophene derivatives. A plot of insoluble deposit vs. concentration of added alkyl sulfide produces a negative slope. It appears that the inhibiting mechanism for alkyl sulfides is a result of the compound's reactivity with intermediate soluble precursors to deposit in the fuel. A method of approximating the relative basicity of weak organosulfur bases was developed via measurement of their resonance chemical shifts in proton NMR. Linear plots of log gm. deposit vs. change in chemical shift (shift differences between sulfur bases neat and complexed with I2) were found for alkyl sulfides and alkyl thiols. This suggests the possibility that increased deposit formation is due to base catalysis with these compound classes. Author (GRA)

N81-33308# Teledyne CAE, Toledo, Ohio.
EXPENDABLE GASIFIER Final Report. Mar. 1976 - Dec. 1980
Al Gabrys and Hans Due Mar. 1981 456 p refs
(Contract F33657-76-C-2055; AF Proj. 3145)
(AD-A103528; TCAE-1738; AFWAL-TR-81-2004) Avail: NTIS HC A20/MF A01 CSCL 21/5

The expendable gasifier provides, in a single cost-effective configuration, the core for either a jet fuel starter or a thrust engine for remotely piloted vehicles (RPV's). The gasifier is 12.9 inches in diameter, 18.6 inches long, weighs 78 pounds, and consists of a four-stage axial compressor, a reverse-flow annular vaporizer combustor, a single stage axial turbine and a bearing system that supports the main shaft. The expendable gasifier was designed, fabricated and tested during this program. Test results verified the viability of the gasifier as a potential core for jet fuel starters or thrust engine for RPV's, and cost analysis shows that, in the jet fuel starter application, the expendable gasifier would substantially reduce the life cycle cost versus conventional jet fuel starters. Author (GRA)

N81-33309# United Technologies Corp., South Windsor, Conn. Power Systems Div.
CHARACTERIZATION OF THE PERFORMANCE OF ADIABATIC REFORMERS OPERATED WITH LOGISTIC FUELS Final Technical Report
J. A. S. Bett, R. R. Lesieur, A. P. Meyer, and H. J. Setzer 30 Jul. 1981 35 p ref
(Contract DAAK70-80-C-0115)
(AD-A103622; PSD/UTC-FCR-3404) Avail: NTIS HC A03/MF A01 CSCL 18/9

United Technologies Corporation, in cooperation with the Electric Power Research Institute, has developed an adiabatic steam reformer capable of processing sulfur-containing fuels for commercial fuel cell power plants. No. 2 fuel oil and various coal-derived liquids have recently been successfully reformed to hydrogen using advanced catalyst formulations. The objective of this program is to determine the performance of the adiabatic reformer when operated with military logistic fuels. The test data will form the basis for system evaluation of the use of the adiabatic reformer in Army 'SLEEP' power plants using military logistic fuels. A two-inch diameter adiabatic reformer capable of supplying the hydrogen required for a 2.5 kW to 6 kW power plant was loaded with advanced metal oxide and nickel catalysts. It ran over 1400 hours; 840 hours with No. 2 fuel oil as reference fuel, 350 hours on unleaded gasoline, and 216 hours on diesel fuel. The performance of the reformer on No. 2 fuel oil (for calibration against previous tests) closely matched previous tests both with respect to fuel conversion and carbon formation characteristics. After an initial decay period of about 200 hours, the performance remained stable for the remaining 1200 hours of test. The reformer operated at conditions set as design goals for a commercial fuel cell power plant. With unleaded gasoline, the tendency for carbon formation was greatly reduced; even at the lowest values for oxygen to carbon ratio in the process steam no carbon was detected. Operating parameters were defined for each of the fuels. The effect of steam/carbon ratio, pressure and fuel flow rate on fuel conversion was determined. GRA

N81-33310# Naval Research Lab., Washington, D. C.
THE SOLUBILITY OF WATER IN CURRENT JP 5 JET TURBINE FUELS Interim Report
W. A. Affens, R. N. Hazlett, and J. D. DeGuzman 25 Aug. 1981 16 p refs
(ZE65571006)
(AD-A103266; NRL-MR-4609) Avail: NTIS HC A02/MF A01 CSCL 17/7

Current JP-5 jet fuels have been observed to contain significantly greater concentrations of aromatic hydrocarbons than had been reported for earlier JP-5 samples. Water solubility is a very important property of jet fuels and is greatly influenced by aromatic concentration. For these reasons, a study was made of current JP-5 fuel samples to determine whether they might exhibit a greater water solubility than that of earlier JP-5 fuels. Water solubility measurements of ten relatively recent JP-5 fuel samples were determined at 10, 25, and 40 C. The water solubilities, on the average, were about 25% greater than that from earlier literature data. This suggests that the increased aromatic content plays a part in the increased water solubility. The water solubilities were found to vary with temperature in accordance with the Van't Hoff equation as is normal with hydrocarbon mixtures. The straight line plots of the logarithm of concentration vs. reciprocal temperature gave typical slopes and intercepts. Author (GRA)

N81-33311# Ballistic Research Labs., Aberdeen Proving Ground, Md.
RELATIVE EROSIVITY OF NITRAMINE, TRIPLE-BASE, AND DOUBLE-BASE PROPELLANTS
R. P. Kaste, I. C. Stoble, J. R. Ward, and B. D. Bensinger Jul. 1981 42 p refs Presented at JANNAF Propulsion Meeting, New Orleans, 26-28 May 1981
(DA Proj. 1L1-61102-AH-43)
(AD-A104064; AD-E430672; ARBRL-TR-02339) Avail: NTIS HC A03/MF A01 CSCL 19/1

A series of nitramine, triple-base, and double-base propellants in lots with flame temperatures of 2,700, 3,000 and 3,300 K were tested for relative erosivity in vented chambers at BRL, Princeton University and the Large Caliber Weapons Systems Laboratory (LCWSL). During initial testing, the BRL results suggested that the nitramine propellants were no more erosive then their double- or triple-base counterparts. The Princeton experiments concluded the opposite. The LCWSL results suggested the 2,700 K nitramine was more erosive than other 2,700 K propellants, but the higher-flame temperature nitramines seemed no more erosive. One weakness in the BRL tests was the small mass losses measured with the 2,700 K propellants which could have masked differences among these propellants. To rectify this, the erosivity of the nine propellants was measured with a smaller diameter nozzle to increase mass loss per round. The results with the smaller diameter nozzle confirmed that the nitramines were no more erosive than the other propellants with the same flame temperatures. Author (GRA)

N81-33312# Utah Univ., Salt Lake City. Dept. of Mining and Fuels Engineering.
CHEMISTRY AND CATALYSIS OF COAL LIQUEFACTION, CATALYTIC AND THERMAL UPGRADING OF COAL LIQUID, AND HYDROGENATING OF CO TO PRODUCE FUELS Quarterly Progress Report, Jan. - Mar. 1981
Wendell H. Wiser Jun. 1981 56 p refs
(Contract DE-AC22-79ET-14700)

(DOE/ET-14700/6) Avail: NTIS HC A04/MF A01

Topics covered include: (1) coal cluster solubilization; (2) carbon-13 NMR investigation of coal derived liquids (CDL) and coal; (3) catalysis and mechanism of coal liquefaction; (4) fundamental chemistry and mechanism of pyrolsis of bituminous coal; (5) catalytic hydrogenation of CDL and related polycyclic aromatic hydrocarbons; (6) denitrogenation and deoxygenation of CDL and related N- and O- compounds; (7) catalytic cracking of hydrogenated CDL and related hydrogenated compounds; (8) hydropyrolysis (thermal hydrocracking) of CDL; (9) systematic structural-activity study of supported sulfide catalysts for coal liquids upgrading; (10) diffusion of polyaromatic compounds in amorphous catalyst supports; (11) catalyst research and development; and (12) characterization of catalysts and mechanistic studies. DOE

N81-33313# New Hampshire Univ., Durham. Dept. of Chemical Engineering.

SOLAR-ENHANCED COAL GASIFICATION USING HIGH-TEMPERATURE SOLAR ENERGY

S. M. Lakshmanan, F. K. Manasse, and V. K. Mathur 1980 21 p refs Presented at the Natl. Solar Energy Conv., Annamalainagar, India, Dec. 1980

(Contract DE-AC02-79ET-21067)

(DE81-025020; CONF-801264-1) Avail: NTIS HC A02/MF A01

A fluidized bed coal gasification system using solar energy for the production of synthesis gas is described. The problems relating to its commercialization are also discussed. DOE

N81-33314# Oklahoma State Univ., Stillwater. School of Chemical Engineering.

CATALYSTS FOR UPGRADING COAL-DERIVED LIQUIDS Quarterly Report, 1 Apr. - 30 Jun. 1981

B. L. Crynes 16 Jul. 1981 21 p ref

(Contract DE-AC22-79ET-14876)

(DE81-028332; DOE/ET-14876/T4) Avail: NTIS HC A02/MF A01

Five catalysts were analyzed for pore size distributions of characterize their properties for selection for future experimentation. Also, several coal liquid feedstocks were obtained and were analyzed in preparation for future studies. Four experimental runs were conducted in the Catalyst Life test Unit using a 30 wt % SRC in process solvent mixture. These runs were conducted using a Shell 324 catalyst (NiO-MoO3) at a temperature of 3990 C and a pressure of 13.9 MP. The purpose of these runs was to obtain conditioned catalysts in order to assess the coking and deactivation response. Hydrodenitrogenation and hydrogenation of the catalysts decayed over the interval of study of these four experimental runs. Experimental time was from 1 up to 160 hours of oil catalyst contact. DOE

N81-33315# Texas A&M Univ., College Station. Dept. of Chemical Engineering.

STUDY OF THE CATALYTIC CONVERSION OF SYNTHESIS GAS TO LOW-MOLECULAR WEIGHT HYDROCARBONS M.S. Thesis

T. Y. Chan Aug. 1981 112 p refs

(Contract DE-AS22-78PC-04717)

(DE81-028157; DOE/PC-04717/6) Avail: NTIS HC A06/MF A01

Utilizing nontrival bifunctional catalysts which can catalyze methanol synthesis and methanol decomposition to hydrocarbons, synthesis gas was converted to hydrocarbons with selectivity of 100 percent for C1 to C4 at reaction temperatures of 595 to 7310 K and pressures from 27 to 68 atm. Zinc oxide and copper oxide were used to promote the methanol synthesis, and the acidic-ion exchanged form of erionite was used to catalyze the subsequent methanol decomposition to hydrocarbons. Methanol and/or dimethylether which are the precursors for hydrocarbons were found in the reactor exit. The hydrocarbons produced were between C1 and C4 which demonstrate the shape selectivity of erionite. The olefinic content of the hydrocarbon produced was small compared to the paraffinic content. Experiments with ethylene and hydrogen inthat the methanol synthesis component of the hybrid catalyst was highly active toward olefin hydrogenation. Addition of water into the feed of ethylene and hydrogen caused a substantial reduction of ethylene hydrogenation. The water gas shift reaction, catalyzed by methanol synthesis component, was observed to be in dynamic equilibrium. DOE

N81-33316# Oak Ridge National Lab., Tenn.

IMPACT OF ENVIRONMENTAL CONTROL COSTS ON AN INDIRECT COAL LIQUEFACTION

P. J. Johnson, R. M. Wham, S. P. N. Singh, and J. F. Fisher Aug. 1981 218 p refs

(Contract W-7405-eng-26)

(DE81-026541; ORNL-5722) Avail: NTIS HC A10/MF A01

The effect on product price of three different scenarios for the control of emissions to the environment by a conceptual, commercial indirect coal liquefaction facility is examined. The plant design utilizes Lurgi dry-ash gasifiers operating on western, subbituminous coal to provide synthesis gas for low pressure methanol synthesis and subsequent conversion of the methanol to gasoline. Levels of emission control, which are based as much as possible on existing regulations for analogous processes, range from minimal control to more stringent control than that currently in effect. The use of several emission control options and the reduction of plant size are also examined in regard to their effects on product price. Environmental control to current levels would account for 12% of the product price for the facility assumed here. More stringent emission standards would produce an additional price. Two unpredictable factors having the greatest impacts on product price, however, are inflation and the method of financing. DOE

N81-33317# Battelle Pacific Northwest Labs., Richland, Wash.

ENHANCEMENT OF METHANE PRODUCTION IN THE ANAEROBIC DIGESTION OF MUNICIPAL SEWAGE SLUDGE

DOE Jun. 1981 151 p refs

(Contract DE-AC01-76CS-20300)

(DE81-027246; DOE/CS-20300/1) Avail: NTIS HC A08/MF A01

The effect of powdered activated carbon and other additives on digester performance was evaluated in this report. The objectives of the project include optimizing the carbon addition process for maximum methane production, identifying anciliary benefits, establishing design criteria for application at full scale facilities, asessing technical and economic feasibility, and estimating the impact of the technology on a nationwide basis. Results indicate that the actual feasibility of carbon addition technique would produce beneficial effects only at those sites where digesters are operating poorly. DOE

N81-33318# Public Service Electric and Gas Co., Newark, N.J.

DEVELOPMENT OF A CASE STUDY FOR THE CINNAMINSON LANDFILL METHANE RECOVERY OPERATION

Gerald W. Schirra, Thomas E. Sharp, and Douglas C. Nielson (Wehran Energy Corp.) Feb. 1981 67 p

(Contract W-31-109-eng-38)

(DE81-029988; ANL/CNSV-TM-73) Avail: NTIS HC A04/MF A01

The development, construction, and operation of a methane recovery plant on the site of a sanitary landfill are described. The project was undertaken in 2 phases. At the end of the 1st phase, 250,000 cu ft/day of gas (heating value of 600 Btu cu ft) was being produced by the facility and consumed by a nearby industry. At the end of phase 2, 600,000 cu ft/day was being produced (heating value of 561 Btu/cu ft. DOE

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N81-33319* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR PRODUCING CONCENTRIC HOLLOW SPHERES Patent

Taylor G. Wang (JPL, California Inst. of Technology, Pasadena)

and Daniel D. Elleman, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Issued 21 Jul. 1981 6 p Filed 8 May 1979 Supersedes N79-24197 (17 - 15, p 1966) Sponsored by NASA
(NASA-Case-NPO-14596-1; US-Patent-4,279,632; US-Patent-Appl-SN-037072; US-Patent-Class-65-21.4; US-Patent-Class-65-22; US-Patent-Class-65-142; US-Patent-Class-264-5; US-Patent-Class-264-9; US-Patent-Class-264-24; US-Patent-Class-425-6) Avail: US Patent and Trademark Office CSCL 13H

Hollow spheres with precisely concentric inner and outer spherical surfaces are formed by applying vibrations to a nonconcentric hollow sphere while it is at an elevated temperature at which it is fluid or plastic, the vibrations producing internal flows which cause the inner and outer surfaces to become precisely concentric. Concentric spheres can be mass produced by extruding a material such as glass or metal while injecting a stream of gas into the center of the extrusion to form a gas-filled tube. Vibrations are applied to the extruded tube to help break it up into individual bodies of a desired uniform size, the bodies tending to form spherical inner and outer surfaces by reason of surface tension, and the continuing application of vibrations causing these surfaces to become concentric.

Official Gazette of the U.S. Patent and Trademark Office

N81-33320# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
OPTICAL AUTOMATIC CONTROL FOR THE LATHING OF PARTS [AUTOMATISK OPTISK KONTROLL AV SVARVAEMNEN]
Roger Cederberg and Soeren Svensson Oct. 1979 21 p refs In SWEDISH
(FOA-C-30175-E) Avail: NTIS HC A02/MF A01

Image processing for the analysis of forms, contour recognition, etc., was studied. The work was related to an industrial context, and a pilot project for image processing with factory applications was established. Author (ESA)

N81-33321# Stuttgart Univ. (West Germany). Inst. fuer Thermische Stroemungsmaschinen und Maschinenlab.
COMMEMORATION OF THE 60TH ANNIVERSARY OF PROFESSOR DOCTOR JAKOB WACHTER [FESTSCHRIFT. PROF. DR.-ING J. WACHTER ZUM 60. GEBURTSTAG]
Jan. 1980 356 p refs In GERMAN Presented at Stuttgart, Jan. 1980 Sponsored in part by FIMA-Fischachtaler Maschinenbau GmbH
Avail: NTIS HC A16/MF A01

Flow characteristics and dynamic behavior and losses in turbomachine parts are discussed. Data processing of measurement results and test facilities are described. District heating with waste heat and vibration characteristics of rotor blades are covered. For individual titles, see N81-33322 through N81-33338.

N81-33322# Stuttgart Univ. (West Germany).
STAGES OF DEVELOPMENT. A CENTURY OF MEASURING TECHNIQUES IN A TESTING LABORATORY [STADIEN EINER ENTWICKLUNG - EIN JAHRHUNDERT MESSTECHNIK AM MASCHINENLABORATORIUM] **c35**
M. Busch *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 9-34 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The rise of technical institutes as a consequence of industrial expansion is traced. The creation of a testing laboratory for students and its extension to other types of energy conversion equipment is described. The appropriatness of the present organizational structure in technical education is discussed, and the need for modern electronic measuring equipment stressed. Author (ESA)

N81-33323# Stuttgart Univ. (West Germany).
MEASUREMENT OF AIR FLOW IN EXHAUST-DRIVEN TURBOSUPERCHARGER TWO-CYCLE DIESEL ENGINE [MESSUNG DES LUFTDURCHSATZES AN ABGASTURBOAUFGELADENEN SWEITAKTGROSSDIESELMOTOREN] **c37**
J. Schroeder (Maschinenfabrik Augsburg-Nuernberg A.G., Augsburg, West Germany) *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 35-51 ref In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

It is noted that for large two-cycle Diesel engines the airflow cannot easily be measured with an inlet nozzle on the test stand due to the air intake structure. Also, the installation of a choke measuring instrument is impossible, due to the necessarily long tube section and the pressure losses connected with it. A nozzle with a contour complying with standards and attached diffuser was inserted in a short tube section to obtain low pressure losses and to be able to adjust a satisfactory pressure reading for the measurements. The flow profile in this nozzle is scanned by means of a tube speed indicator. The measured velocity distribution does not correspond to the profile of a turbulent flow in a long tube. The resulting nozzle coefficient is about 9% higher than the value expected from standards. Author (ESA)

N81-33324# Stuttgart Univ. (West Germany).
INVESTIGATION OF THE FLOW IN INLET NOZZLES [UNTERSUCHUNG DER STROEMUNG IN EINSTROEMDUESEN] **c34**
H. Becker *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 53-74 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Pneumatic probes and hot-wire flowmeters are used to show the calculated flow behavior and explain why the value of the flow coefficient does not comply with standards. Author (ESA)

N81-33325# Stuttgart Univ. (West Germany).
COMPARISON OF VELOCITY MEASURING METHODS IN A FREE AIR STREAM [VERGLEICH VON GESCHWINDIGKEITSMESSVERFAHRENIN EINEM LUFTFREISTRAHL] **c34**
J. Schmaldienst *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 75-101 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Several methods to measure velocity are described. A comparison of measurements in the free stream of a simple flow channel (medium : air) shows good agreement with the results obtained by means of conventional probes. However, the results of two contact-free laser measurements (laser two-flows method and laser Doppler-anemometer) show considerable deviations with respect to the other methods. Author (ESA)

N81-33326# Stuttgart Univ. (West Germany).
FLOW MEASUREMENTS IN LOW-PRESSURE STEAM TURBINES WITH CONTINUOUSLY AERATED PROBES [STROEMUNGSMESSUNGEN IN NIEDERDRUCKDAMPFTURBINEN MIT KONTINUIERLICH BELUEFTETEN SONDEN] **c34**
A. Heneka *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 103-120 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Flow measurement with pneumatic probes in vaporous media is discussed. Continuous aeration of the measurement ducts with non-condensing outside air is shown to prevent the vapor from entering the probe mouth. It is important in this process to recognize the falsifying effects of continuous aeration on the measurements, in order to be able to correct from them. The usefulness of the measurement is shown by means of flow measurements behind the output stage of a condensation turbine. Author (ESA)

N81-33327# Stuttgart Univ. (West Germany).
DYNAMIC BEHAVIOR OF LABYRINTH SEALS [DYNAMISCHES VERHALTEN VON LABYRINTHDICHTUNGEN] **c37**
H. Benckert *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 121-142 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The behavior of the force in eccentric labyrinth seals, the induced force components perpendicular to the plane in which the shaft draws aside, and the repulsive force component in that plane were examined. The effects of the internally determined control variables (differential pressure ratio, r.p.m., condition of

the incoming stream, and the labyrinth geometry) and the vibration coefficients of these assembly groups were dealt with. The results were applied to stability calculations for a high-pressure steam turbine and a centrifugal compressor. Author (ESA)

N81-33328# Stuttgart Univ. (West Germany).
CONTRIBUTION TO THE INVESTIGATION OF THE NON-STATIONARY OPERATIONAL BEHAVIOR OF COMPRESSOR SYSTEMS. BEHAVIOR DURING PROLONGED PUMP OPERATION [BEITRAG ZUR UNTERSUCHUNG DES INSTATIONAEREN BETRIEBSVERHALTENS VON VERDICHTERANLAGEN - DAS VERHALTEN BEI LAENGER ANDAUERNDEM PUMPBETRIEB] **c37**
E Kohn and K.-H. Rohne *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 143-155 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Extended pump tests were conducted with two different centrifugal compressor systems. It was shown that with regard to the thermal load of a machine, (also for larger systems) a short-time pump operation is justifiable, depending on the connected reservoir volume. Endangered areas are the covering disks of the wheels in the labyrinth region, the impeller blades in the region of their pressure outlet edge, and the compressor shaft in the region of the last stage. Author (ESA)

N81-33329# Stuttgart Univ. (West Germany).
ESTIMATION OF THE LOSSES IN CENTRIFUGAL COMPRESSION IMPELLER WHEELS OF DIFFERENT OUTLET WIDTH [ABSCHAETZUNG VON VERLUSTEN IN RADIALVERDICHTERLAUFRAEDERN UNTERSCHIEDLICHER AUSTRITTSBREITE] **c37**
B. Woehrl *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 157-174 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The diffuser efficiency of three centrifugal compressor impeller wheels of different wheel outlet width were measured. The losses which can be characterized by the efficiency are divided into flow losses and shock losses. For shock losses a general approximation is deduced from the impulse triangles in the impeller wheel inlet and confirmed by tests. The flow losses are estimated with the help of dissipation coefficients and are described in a general form. Author (ESA)

N81-33330# Stuttgart Univ. (West Germany).
CALCULATION OF FLOW IN TURBOMACHINES [BEITRAG ZUR BERECHNUNG DER STROEMUNG DURCH TURBOMASCHINEN] **c34**
M. vonAllmen and J. Messner *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 175-196 refs In GERMAN Sponsored in part by Deutsche Forchungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

A solution method is presented, which is based on Wu's subdivision of the flow channel in two kinds of flow sheet and which substantially simplifies the numerical treatment of the flow in turbomachines. The difficulties resulting from the necessary discreteness of the flow channel are avoided by transforming the flow channel, including the grid, into a rectangle by means of a contour-conform projection. The likewise transformed flow equations are solved in this rectangle with the help of difference methods. Author (ESA)

N81-33331# Stuttgart Univ. (West Germany).
REALIZATION OF A COMPLEX TECHNOLOGICAL DATA-PROCESSING PROJECT WITH THE HELP OF SOFTWARE ENGINEERING [REALISIERUNG EINES KOMPLEXEN TECHNISCH-WISSENSCHAFTLICHEN EDV-PROJEKTES MIT HILFE DES 'SOFTWARE-ENGINEERING'] **c61**
B. Schulz *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 197-220 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The software-engineering methods originating from commercial data processing were applied to a technological problem. The adequate solution method is depicted from the example of the numerical calculation of flow in turbomachines. The value of top-down programming in large projects is stressed, along with program modularity. Author (ESA)

N81-33332# Stuttgart Univ. (West Germany).
SAAR: TRANSPORT SYSTEM FOR DISTRICT HEATING [FERNWAERMESCHIENE SAAR] **c44**
W. Hochreuther (Saarberg-Fernwaerme GmbH., Saarbruecken, West Germany) *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 221-250 In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The Saar transport system for the utilization of waste heat from power stations and industrial processes for district heating is discussed. Construction of a regional compound system for district heating was demonstrated in the Voelkingen district. Author (ESA)

N81-33333# Stuttgart Univ. (West Germany).
TEST STAND FOR THE OUTPUT STAGE [ENDSTUFENVERSUCHSSTAND] **c09**
J. Jarosch, G. Eyb, and H. Elsasser *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 251-267 In GERMAN Sponsored in part by Deutsch Forschungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

A test stand was built to enable an overall investigation of problems relating to flow, vibration and humidity in the low-pressure parts of large steam turbines for power stations. The test installation, consists of a powerful steam and cooling water system, the actual steam turbine and an extensive control and regulator system. A flow diagram of the steam circuit is given. Author (ESA)

N81-33334# Stuttgart Univ. (West Germany).
COMPUTER-AIDED REGISTRATION AND PROCESSING OF MEASUREMENT DATA OF TESTS ON TURBOMACHINES [RECHNERUNTERSTUETZTE MESSDATENERFASSUNG UND VERARBEITUNG BEI VERSUCHEN AN TURBOMASCHINEN] **c60**
H. P. Diettrich, D. Haller, and M. Voelmle *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 263-282 refs In GERMAN Sponsored in part by Deutsch Forschungsmeinschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The use of a process computer for experimental investigations on thermal hydraulic machines is described. The problems connected with the registration and processing of measurement data are explained using examples and their possibilities of being solved are demonstrated. The connection of intelligent subsystems for preliminary data processing is treated. The performance of the system is pointed out. Author (ESA)

N81-33335# Stuttgart Univ. (West Germany).
THE INFLUENCE OF THE AXIAL DISTANCE ON THE ALTERNATING EXPANSION STRESS OF A TURBINE WHEEL [EINFLUSS DES AXIALSPALTES AUF DIE WECHSELDEHNUNGSBEANSPRUCHUNG EINES TURBINENLAUFRADES] **c39**
J. Beckmann *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 283-298 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The alternating expansion stress in a one stage turbine is investigated for the case of jet nozzle excitation of the rotor blades. The influence of the variable axial distance between the guide wheel and the rotor wheel on the vibration characteristics of the rotor blades was determined by means of semiconductor strain gages attached to the blades and a telemetry system. The results of the measurements are presented and the approximate average stimulus of the excitation is compared with results from the literature. Author (ESA)

N81-33336# Stuttgart Univ. (West Germany).
EXPERIMENTAL INVESTIGATION OF THE VIBRATION CHARACTERISTICS OF LOW-PRESSURE ROTOR BLADES WITH AND WITHOUT INSERTED DAMPING WIRE

[EXPERIMENTELLE UNTERSUCHUNG DES SCHWINGUNGSVERHALTENS VON ND-LAUFSCHAUFELN MIT UND OHNE EINGELEGTEN DAEMPFERDRAHT] **c37**
I. Wolter *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 299-324 refs In GERMAN Sponsored in part by Deutsche Forschungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Rotor blade vibrations were investigated in a compressor driver turbine with output-stage-like blades in a broad range of speeds and by varying the counter pressure. The effect of a damping wire on the vibration amplitude of assembled groups of blades in comparison with free blades was investigated. The experimental results show the influence of the damping arrangement on the vibration characteristics of the blades for the first three eigenmodes of the blades as well as on the vibrations of the assembled group of blades in resonance at a harmonic of the speed. Author (ESA)

N81-33337# Stuttgart Univ. (West Germany).
THE INFLUENCE OF A COVERING BAND ON THE VIBRATION CHARACTERISTICS OF TURBINE BLADES [EINFLUSS DES SCHAUFELDECKBANDES AUF DAS SCHWINGUNGSVERHALTEN VON TURBINENSCHAUFELN] **c37**
H. Wolfs *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 325-342 refs In GERMAN Sponsored by Deutsche Forschungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

Vibration caused by the addition of covering bands, covering plates, and damping wire to turbomachine blades is discussed. Problems both with regard to the numerical calculation and to the experimental analysis are treated as well as the effects on the vibration behavior of blade assemblies. Author (ESA)

N81-33338# Stuttgart Univ. (West Germany).
STRESS DISTRIBUTION OF A FREE LOW-PRESSURE BLADE [DIE SPANNUNGSVERTEILUNG EINER FREISTEHENDEN NIEDERDRUCKSCHAUFEL] **c39**
R. Pfeiffer *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 343-354 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

The stress distribution of a strongly distorted, free turbine blade was determined experimentally with strain gages and mathematically using the finite element method. The measured and calculated eigenfrequencies agreed well with data derived from industrial experience. Author (ESA)

N81-33339# European Space Agency, Paris (France).
COHERENT AND INCOHERENT RADAR SCATTERING FROM ROUGH SURFACES AND VEGETATED AREAS
T. D. Guyenne, comp. and G. Levy, comp. May 1981 166 p refs Proceedings of ESA-EARSeL Workshop, Alpbach, Austria, 16-20 Mar. 1981 Sponsored in cooperation with Austrian Solar and Space Agency and DFVLR
(ESA-SP-166; ISSN-0379-6566) Avail: NTIS HC A08/MF A01

The comparison of scatterometer results and radar images with respect to the physical information content is presented. Scatterometer systems, imaging radar systems, synthetic aperture radar (SAR), volume and surface scatter theories and their applications are studied. Scatterometer measurements on crop and soil surfaces, scatterometer calibration, and optimal polarization concept in radar imaging are discussed. For individual titles, see N81-33340 through N81-33351.

N81-33340# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
INTRODUCTION TO THE WORKSHOP **c32**
A. Sieber *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 13-17 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Research objectives in the use of scatterometers and imaging radar systems are discussed. System design for scatterometers and imaging radars, differences between scatterometers and imaging radars with respect to the measurement of scattered energy, and processing and evaluation of scatterometer data are included. Suggestions for work on theoretical models are given. These topics are related to data evaluation of synthetic aperture radar. Author (ESA)

N81-33341# Technische Hogeschool, Delft (Netherlands). Microwave Lab.
SCATTEROMETER SYSTEMS **c35**
L. Krul *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 19-27 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Scatterometer is defined and the configuration in which it is operated is given for both point and distributed targets. Principles of scatterometer systems are described. Pulse modulation, frequency modulation continuous wave and Doppler shift systems are compared for accuracy, flexibility, and simplicity. A survey is given of the implementation of the systems, including those used in Skylab and Seasat-A. A review of recently developed instruments is given, including block diagrams and specifications. Problems requiring further research are listed. Author (ESA)

N81-33342# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
IMAGING RADAR SYSTEMS **c32**
F. Schlude *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 29-39 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Imaging systems are classified and described. A description of design procedure and problems is provided. Factors affecting image quality of thin point target distributions are analyzed and limitations of this model are pointed out. The imaging of quasi-continuous point distributions and its application to ocean surface imaging are considered. A comparison is made of systems combining imaging and Fourier transformation used in oceanographic research. The technical data of various systems is summarized. Author (ESA)

N81-33343# Canada Centre for Remote Sensing, Ottawa (Ontario).
TRANSFER FUNCTIONS FOR PARTIALLY COHERENT SYSTEMS WITH APPLICATIONS TO SAR **c32**
R. Keith Raney *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 41-52 refs Submitted for publication (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

An impulse response function and a transfer function for partially coherent systems are presented. Properties are derived that describe performance dependance on system phase and amplitude match to input signal characteristics, and to system and signal partial coherence. These partially coherent systems are shown to be energy conservative in the event of coherence variations. Output spectral properties that describe the dependence of multiplicative Rayleigh noise (speckle) on input signal coherence, system coherence and phase match are presented. The general formulation is applied to Synthetic Aperture Radar (SAR) imaging systems. The mean output from a SAR for a random distributed scene input is shown to be not dependent on system focus, system coherence, or scene coherence. A simple expression is derived for the SAR system transfer function, which is the Fourier transform of the impulse response. Quadratic filter theory is introduced. Author (ESA)

N81-33344# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SEA SURFACE SCATTERING **c32**
Richard K. Moore *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 53-61 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Basic mechanisms of sea-surface scattering are described for a two-scale model. The basic concept of Bragg resonance is illustrated with a sinusoidal component of the ocean spectrum. Factors affecting the overall spectrum of ocean waves are listed.

Sketches show the geometry associated with using a scatterometer to calculate windspeed in measurements of radar backscatter from the wind driven sea. The model described is quasi-empirical based upon theoretical calculations and measurements with both spacecraft and aircraft. Problems in accurate determination of model parameters are discussed for aircraft and spacecraft. Details are given of research on capillary wave distribution, the satellite altimeter and other non-imaging techniques for determining wave spectra are set out. Unknown quantities including surface expression of bottom topography are mentioned. Author (ESA)

N81-33345# Canada Centre for Remote Sensing, Ottawa (Ontario).
WAVE ORBITAL VELOCITY, FADE AND SAR RESPONSE TO AZIMUTH WAVES **c32**
R. K. Raney *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 63-70 refs Submitted for publication (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Orbital velocity bunching as an explanation of the response of SAR is proposed, and the restraint of the coherence time of the scattering centers is considered. Key results in random scene image theory as applied to the azimuth wave problem are summarized. Doppler shifts are shown to be a function of wave and sensor geometry. The first order consequence of orbital motion is shown to induce a redistributed scatterer density that may be considered independently from specific SAR performance parameters and the new density can be convolved with the SAR transfer function to derive the expected output image. Focus perturbation of azimuth wave imagery is observed to occur, but only for a specific subset of wave length and wave height circumstances. Scatterer fade is shown to be of central importance in the SAR transfer function. Author (ESA)

N81-33346# Kansas Univ., Lawrence. Remote Sensing Lab.
A REVIEW OF SURFACE SCATTER THEORIES FOR MODELING APPLICATIONS **c32**
A. K. Fung *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 71-82 refs (For primary document see N81-33339 24-31)
(Grants NSF ENG-79-09374; DAAG29-80-K-0018)
Avail: NTIS HC A08/MF A01

The principles and basic characteristics of some common surface scatter models are reviewed. The methods for developing scatter models discussed include the Kirchhoff method, the geometric optics method, the perturbation method, the two-scale method, the facet method, the variational method, the full-wave method, the diagram method, and the moment method. The applications of several of these models to land and sea scatter are illustrated and areas for further studies are indicated.
Author (ESA)

N81-33347# Kansas Univ., Lawrence. Remote Sensing Lab.
A REVIEW OF VOLUME SCATTER THEORIES FOR MODELING APPLICATIONS **c32**
A. K. Fung *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 83-92 refs (For primary document see N81-33339 24-31)
(Grants NSF ENG-79-09374; DAAG29-80-K-0018)
Avail: NTIS HC A08/MF A01

Volume scatter theories commonly applied to develop scatter models for vegetation, snow and sea ice are reviewed. These include the first-order theories based on the Born approximation and the renormalization method; and the multiple scatter theories based on the radiative transfer method and the matrix doubling method. The merits of these scattering theories are compared with those developed by Twersky and Rytov. Applications of the scatter models developed from a first-order theory and a multiple scatter theory are illustrated. Author (ESA)

N81-33348# Marconi Co. Ltd., Chelmsford (England).
SCATTERING THEORY WITH APPLICATION TO SYNTHETIC APERTURE RADAR **c32**
S. Rotheram *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 93-98 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

A Green's function scattering theory is outlined analogous to the T-matrix scattering theory of quantum mechanics and using an integral equation of the Lippman Schwinger type. To apply the scattering theory to microwave imaging the Green's function representations are combined with a system model. A number of SAR imaging mechanisms are identified. These include complex Bragg waves, azimuthal tilting, a motion effect cut-off and a temporal resolution effect. An application to SAR 580 processing is indicated. Author (ESA)

N81-33349# Centre National de la Recherche Scientifique, Toulouse (France). Centre d'Etude Spatiale des Rayonnements.
SCATTEROMETER MEASUREMENTS ON CROP AND SOIL SURFACES **c43**
Thuy LeToan *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 99-110 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Scatterometer experiments on soil moisture detection and crop monitoring are summarized. Radar backscatter is found to be correlated to and sensitive to the soil moisture of the upper layer 0 to 5 cm at frequencies of 4 to 5 GHz and at an angle of incidence of 0 to 20 deg. The influence of soil texture on dielectric properties of moist soils led to defining a moisture parameter that accounts for this dependence. Research on crop identification and monitoring pointed out the large fluctuations of backscattering coefficient with time during the growing season, thus the need of multidate data for crop identification potentialities of radar for crop parameter detection and growth stage determination. Author (ESA)

N81-33350# Illinois Univ. at Chicago Circle, Chicago. Communications Lab.
OPTIMAL POLARIZATION CONCEPT IN RADAR IMAGING **c32**
Wolfgang-M. Boerner *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 129-142 refs Sponsored also by Humboldt Fellowship National Science and Engineering Research Council of Canada and NATO (For primary document see N81-33339 24-31)
(Contracts N00014-80-C-0708; N00014-80-C-0073; Grant DRXR-OPR-P-17227-EL)
Avail: NTIS HC A08/MF A01

Polarization as a factor of electromagnetic scattering is discussed. Due to the vector nature of electromagnetic waves, electromagnetic remote sensing and inverse scattering techniques, if applied rigorously, require incorporation of polarization information into their formulation. By applying this approach to existing and some novel theories, improvements in quality and fidelity of the reconstructed profiles and/or images can be obtained. The development of methods and theories of vector inverse scattering for the electromagnetic polarization-dependent case or in the more complicated seismic case of p and s-wave interaction in elastic media, as for example in Vertical Seismic Profiling, is advocated. Radar scattering matrices and radar measurables are described, as are polarization descriptors. Author (ESA)

N81-33351# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SCATTEROMETER CALIBRATION AND DATA CORRECTION **c43**
Richard K. Moore *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 149-163 (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

Calibration of radars used for scatterometer purposes and the calibrations necessary to recover the scattering coefficient from the data are discussed. If calibration permits repeatable measurements the system has good relative calibration. Absolute calibration is needed to compare measurements made by different systems or when design data for new systems is needed. Relative calibration may best be done by using a sample of the transmitted signal as a test signal to determine receiver response. Absolute calibration requires either separate calibrations of each part, which are then combined, or the return from a standard target may be used to calibrate the entire system. Surface and volume scatter calculations are illustrated for various situations. Author (ESA)

N81-33352# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Automatic Data Processing Center.
LIST OF SOILS, SOIL-STRUCTURE INTERACTION AND OTHER RELATED COMPUTER PROGRAMS AVAILABLE FOR LMVD ENGINEERS Final Report
N. Radhakrishnan and Paul K. Senter May 1981 151 p
(AD-A103384; WES-TR-K-81-1) Avail: NTIS HC A08/MF A01 CSCL 13/13

This report presents a list of soils, soil-structure interaction, and other related computer programs available for engineers of the Lower Mississippi Valley Division. Programs for use in the following subject areas are listed: T-walls; slope stability; piles; sheet piles, and cells; seepage; stress computation, settlement, and consolidation; piezometer data; instrumentation and laboratory data; plotting programs; finite element and finite difference methods; earthquakes and dynamics; and others. Also included are abstracts of some of the listed programs. Author (GRA)

N81-33353# Naval Ship Research and Development Center, Bethesda, Md. Central Instrumentation Dept.
SURFACE EFFECT SHIP AIR CAVITY PRESSURE GAGES Final Report, Jun. 1974 - Aug. 1980
Charles D. Bradley Jul. 1981 67 p refs
(ZF61412001)
(AD-A103193; DTNSRDC/CID-81/1) Avail: NTIS HC A04/MF A01 CSCL 14/2

Attempts were made to extend the design of an existing waterproof, high frequency, foil strain gaged, flush diaphragm, 10 psi pressure gage to the 1 psi range. Three diaphragm configurations were investigated: uniform thickness, tapered thickness, and cantilever supported. Design equations, for constructing these three types of diaphragms are given. From information derived from these equations, promising candidate pressure gages were built: uniform thickness diaphragm gages made of various plastic materials, and a cantilever supported diaphragm gage with membrane coverings of two different thickness. Also one gage was built using a foil strain gage itself as the diaphragm. The results of the static calibrations and frequency response measurements are given for these gages. One experimental cantilever supported diaphragm gage looks promising for further development. Suggestions for improving its performance are given. Author (GRA)

N81-33354# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
CREEP BEHAVIOR OF FROZEN SAND, PART 1 Final Report, Feb. 1977 - Mar. 1981
R. Torrence Martin, John M. Ting, and Charles C. Ladd Jun. 1981 240 p refs
(Contract DAAG29-77-C-0016)
(AD-A103556; R81-19-Pt-1; ARO-14725.3-G3) Avail: NTIS HC A11/MF A01 CSCL 08/13

A total of 150 tests were run to evaluate the applicability of rate process theory, RPT, for frozen soil. Three creep test types: constant load into tertiary creep, temperature stage test under constant load, and stress stage test under constant temperature were used to obtain the parameters in the RPT equation. The soil was Manchester Fine Sand, MFS, at ice saturation of 40 and 100% and a constant relative density investigated over a temperature range -11 to -27 C with control of a given temperature to + or - 0.02 C. GRA

N81-33355# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
STUDY OF ELECTROPOLISHING OF FERROUS ALLOYS USING ROTATING-DISK ELECTRODES
T. Hryniewich, R. H. Muller, and C. W. Tobias Jun. 1981 127 p refs
(Contract W-7405-eng-48)
(DE81-028898; LBL-12879) Avail: NTIS HC A07/MF A01

Studies were performed on the rotating disk electrode system under controlled electrochemial and hydrodynamic conditions to establish conditions at which the best surface finish, after electropolishing of different types of ferrous alloys, may be achieved. The investigations were made over a wide range of applied current density, mass loss, and current efficiency using pure iron, armco iron, steels 1018, 1028, 1040, 1060, 1080, 4141 and H13 and 01 toolsteels. Characteristics of the finished surfaces are described. DOE

N81-33356# Los Alamos Scientific Lab., N. Mex.
ATTACHED-SUNSPACE PASSIVE SOLAR-HEATED RESIDENCES: A STUDY OF NATIONWIDE PATTERNS OF ECONOMIC FEASIBILITY FOR THE EXISTING HOUSING STOCK
F. Roach and C. Kirschner Jun. 1981 135 p
(Contract W-7405-eng-36)
(DE81-026309; LA-8889-MS) Avail: NTIS HC A07/MF A01

Performance estimates for attached-sunspace passive solar-heated residences were incorporated into the Los Alamos/UNM EASE 3 Model. These estimates are used to analyze the economic performance of a passive sunspace design when retrofitting onto an existing single-family home. Several key parameters are evaluated, including loan or mortgage terms, ownership period, resale potential, and competing conventional fuel prices. General economic and design parameters are combined in one version of life-cycle costing to evaluate the feasibility of both owner-built and contractor-built attached sunspaces for 220 regions in the contiguous US. The conventional fuel alternatives are natural gas, heating oil, electric resistance, and electric heat pump. The optimal sunspace design in determined for the fuel alternatives by minimizing the combined solar and conventional delivered cost of heat. An analysis of fuel used for space heating in existing homes is used to discuss the retrofit potential for the 220 regions. Results show that the prospect for conventional fuel displacement through retrofit of attached sunspace is very good, and that the design's economic performance is enhanced in regions with expensive conventional fuel alternatives. DOE

N81-33357# Leitz (Ernst) G.m.b.H., Wetzlar (West Germany). Ressort Entwicklung.
MEASURING DEVICES FOR PRECISION MANUFACTURING AND QUALITY CONTROL Final Report
Joerg Wilhelm, Hans-Dieter Jacoby, and Hans-Juergen Preuss Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 33 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-139; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,95

Various miniaturized and low cost transducers were developed for different applications in metrology, precision manufacturing and fabrication control. They comprise: (1) photoelectric linear transducer with micron step pression; (2) incremental and coded transducers; (3) concave mirror x-y transducer; (4) correlation systems for linear and speed measurements; (5) high resolution angle transducers; and (6) correlation optical sensor for distance measurement. Operation principles are explained and several applications are illustrated. Some of the devices are already available. Author (ESA)

N81-33358# Vereinigte Aluminium-Werke A.G., Bonn (West Germany). Leichtmetall-Forchungsinst.
DEVELOPMENT OF A TECHNICAL PROCESS FOR THE USE OF DOMESTIC CLAYS AS RAW MATERIAL FOR THE ALUMINUM INDUSTRY Final Report
Guenter Winkhaus, Friedrich Albert Schwind, and Milan Belsky Bundesministerium fuer Forschung und Technologie Dec. 1980 81 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-148; ISSN-0340-7608; LF-224) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

The technical and economic feasibility of the extraction of reduction-grade alumina from German clay (from the Upper Palatinate) was examined by experimental work and by the evaluation of numerous information from other sources. Concepts are developed for the processing of domestic clays and the economy of the process is discussed. The clay deposits are regarded as a valuable raw material source. Before transfering this technology of alumina extraction to large-scale production, further process engineering and optimization are needed.
Author (ESA)

N81-33359# Transportation Research Board, Washington, D.C.
SHALES AND SWELLING SOILS
John A. Franklin, Albert F. DiMillio, William E. Strohm, Jr., Bruce C. Vandre, and Loren R. Anderson 1981 100 p refs
(PB81-218802; TRB/TRR-790; ISBN-0-309-03204-0; ISSN-0361-1981) Avail: NTIS HC A05/MF A01 CSCL 13B

The thirteen (13) papers in this report deal with the following areas: a shale rating system and tentative applications to shale performance; technical guidelines for the design and construction of shale embankments; stability of waste shale embankments; dynamic response of raw and stabilized Oklahoma shales; laboratory studies of the stabilization of nondurable shales; swelling shale and collapsing soil; development of a laboratory compaction degradation test for shales; soil section approach for evaluation of swelling potential soil moisture properties of subgrade soils; volume changes in compacted clays and shales on saturation; characterization of expansive soils; pavement roughness on expansive clays; and deep vertical fabric moisture barriers in swelling soils. GRA

N81-33360# California Univ., Berkeley. Center for Planning and Development Research.
EARTHQUAKE ADVISORY SERVICES: A PROTOTYPE DEVELOPMENT PROJECT
Henry J. Lagorio and Hal Levin Oct. 1980 88 p refs
(Grant NSF PFR-78-17842)
(PB81-210825; NSF/RA-800493) Avail: NTIS HC A05/MF A01 CSCL 13M

Development of the prototype Earthquake Advisory Service (EAS) is reported. The EAS is designed to provide direct technical assistance and written materials to advise people who wish to make informed decisions about earthquake hazard reduction in their residences. It is intended also to be adapted to local conditions by community-based agencies. The EAS prototype involved the testing of early assumptions about program implementation, establishment of a systematic methodology review process, and a review of published information pertinent to the project. Operational procedures of the program and the process leading to implementation guidelines are described. GRA

N81-33361# Agbabian Associates, El Segundo, Calif.
INVESTIGATION OF THE SEISMIC RESISTANCE OF INTERIOR BUILDING PARTITIONS, PHASE 1
R. W. Anderson, Y.-C. Yee, G. Savulian, B. Barclay, and G. Lee Feb. 1981 89 p refs
(Grant NSF PFR-80-09921)
(PB81-210973; NSF/CEE-81006) Avail: NTIS HC A05/MF A01 CSCL 13M

The effective participation of wood-framed interior shear wall partitions when determining the ultimate resistance capacity of two- and three-story masonry apartment buildings to seismic loading was investigated. Load vs. deflection tests were performed on 8 ft by 8 ft wall panel specimens constructed of four different facing materials, including wood lath and plaster, gypsum lath and plaster, and gypsum wallboard with joints placed either horizontally or vertically. The wood lath and plaster construction is found to be significantly stronger and stiffer than the other three specimens. Analyses of the test panels using finite element methods to predict their static resistance characteristics indicates that the facing material acts as the primary shear-resisting structural element. Resistance of shear wall partitions to lateral loads was assessed. GRA

N81-33362# Earthquake Engineering Research Inst., Berkeley, Calif.
OPTNSR: AN INTERACTIVE SOFTWARE SYSTEM FOR OPTIMAL DESIGN OF STATICALLY AND DYNAMICALLY LOADED STRUCTURES WITH NONLINEAR RESPONSE
M. A. Bhatti, V. Ciampi, K. S. Pister, and E. Polak Jan. 1981 187 p refs
(Grant NSF PFR-79-08261)
(PB81-218851; UCB/EERC-81/02; NSF/ENG-81002) Avail: NTIS HC A09/MF A01 CSCL 13M

A software system for optimization-based, interactive computer-aided design of statically and dynamically loaded structures with nonlinear response is described. The system combines two programs, INTEROPTDYN and MINI-ANSR. The program INTEROPTDYN is based on a feasible directions algorithm for solving a constrained optimization problem, where both nonparametric and parametric (time-dependent) constraints are allowed. Program MINI-ANSR is a modification of an existing general purpose structural analysis program, ANSR-1. Details of these programs are described, together with an interfacing package connecting the analysis and optimization phases of the design process. Stop and restart capability as well as user-supplied changes in both design variables as well as parameters in the optimization algorithm are available. GRA

N81-33363 Newcastle-upon-Tyne Univ. (England). Dept. of Mechanical Engineering.
AN APPROACH TO THE POTENTIAL IMPORTANCE OF INFORMATION IN ENGINEERING
A. S. Ritz and B. S. Owen Jan. 1981 202 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5603) Avail: British Library Lending Div., Boston Spa, Engl.

The potential value of information in the execution of engineering projects was assessed. For each of three projects the background of potentially useful information was explored and compared with the information actually being used, methods being chosen in each case to suit the circumstances. It was found necessary to become familiar with the technical detail of the projects and to examine critically the research aims and information practices. In general no vast reservoir of immediately useful information was found, much of the information used deriving from the individual engineer's own training and resources. The information flow was regarded as adequate for the practical purposes of the projects. However, awareness of research information potentially useful for long range planning was limited, the main obstacles to information flow of this type are management, attitudes, and organizational constraints. J.M.S.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N81-33364*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ON THE ERROR STATISTICS OF VITERBI DECODING AND THE PERFORMANCE OF CONCATENATED CODES
R. L. Miller, L. J. Deutsch, and S. A. Butman 1 Sep. 1981 41 p refs
(Contract NAS7-100)
(NASA-CR-164858; JPL-Pub-81-9) Avail: NTIS HC A03/MF A01 CSCL 17B

Computer simulation results are presented on the performance of convolutional codes of constraint lengths 7 and 10 concatenated with the (255, 223) Reed-Solomon code (a proposed NASA standard). These results indicate that as much as 0.8 dB can be gained by concatenating this Reed-Solomon code with a (10, 1/3) convolutional code, instead of the (7, 1/2) code currently used by the DSN. A mathematical model of Viterbi decoder burst-error statistics is developed and is validated through additional computer simulations. Author

N81-33365*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF RECEIVER TRACKING PHASE ERROR ON THE PERFORMANCE OF THE CONCATENATED REED-SOLOMON/VITERBI CHANNEL CODING SYSTEM
K. Y. Liu 1 Sep. 1981 62 p refs
(Contract NAS7-100)
(NASA-CR-164587; JPL-Pub-81-62) Avail: NTIS HC A04/MF A01 CSCL 17B

Analytical and experimental results are presented of the effects of receiver tracking phase error, caused by weak signal conditions on either the uplink or the downlink or both, on the performance of the concatenated Reed-Solomon (RS) Viterbi channel coding system. The test results were obtained under an emulated S band uplink and X band downlink, two way space communica-

tion channel in the telecommunication development laboratory of JPL with data rates ranging from 4 kHz to 20 kHz. It is shown that, with ideal interleaving, the concatenated RS/Viterbi coding system is capable of yielding large coding gains at very low bit error probabilities over the Viterbi decoded convolutional only coding system. Results on the effects of receiver tracking phase errors on the performance of the concatenated coding system with antenna array combining are included. A.R.H.

N81-33366*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPTICAL DEEP SPACE COMMUNICATION VIA RELAY SATELLITE
Robert M. Gagliardi, Victor A. Vilnrotter, and Samuel J. Dolinar, Jr. 15 Aug. 1981 67 p refs
(Contract NAS7-100)
(NASA-CR-164855; JPL-Pub-81-40) Avail: NTIS HC A01/MF A01 CSCL 17B

The possible use of an optical for high rate data transmission from a deep space vehicle to an Earth-orbiting relay satellite while RF links are envisioned for the relay to Earth link was studied. A preliminary link analysis is presented for initial sizing of optical components and power levels, in terms of achievable data rates and feasible range distances. Modulation formats are restricted to pulsed laser operation, involving bot coded and uncoded schemes. The advantage of an optical link over present RF deep space link capabilities is shown. The problems of acquisition, pointing and tracking with narrow optical beams are presented and discussed. Mathematical models of beam trackers are derived, aiding in the design of such systems for minimizing beam pointing errors. The expected orbital geometry between spacecraft and relay satellite, and its impact on beam pointing dynamics are discussed. A.R.H.

N81-33367# Committee on Science and Technology (U. S. House).
NASA SPACE COMMUNICATIONS PROGRAM
Washington GPO 1981 180 p refs Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 17, 8-9 Jul. 1981
(GPO-83-236) Avail: Subcommittee on Space Science and Applications

The role played by NASA in the establishment of domestic satellite communications systems, and the development of technology for C-band and KU-band communication is reviewed. Research and development activities to assure the availability of adequate and affordable satellite communications beyond 1990 are examined with particular emphasis on 30/20 GHz technology. A.R.H.

N81-33368*# Mitre Corp., Bedford, Mass.
ON-BOARD PROCESSING FOR FUTURE SATELLITE COMMUNICATIONS SYSTEMS: SATELLITE-ROUTED FDMA Final Technical Report
George Berk, Paul F. Christopher, Murray Hoffman, Paul N. Jean, Ersch Rotholz, and Brian E. White May 1981 293 p refs Sponsored in part by NASA
(Contract F01628-81-C-0001; AF Proj. 8680)
(NASA-CR-164443; NASA/LeRC-C-49029-D; MTR-8311) Avail: NTIS HC A13/MF A01 CSCL 17B

A frequency division multiple access (FDMA) 30/20 GHz satellite communications architecture without on-board baseband processing is investigated. Conceptual system designs are suggested for domestic traffic models totaling 4 Gb/s of customer premises service (CPS) traffic and 6 Gb/s of trunking traffic. Emphasis is given to the CPS portion of the system which includes thousands of earth terminals with digital traffic ranging from a single 64 kb/s voice channel to hundreds of channels of voice, data, and video with an aggregate data rate of 33 Mb/s. A unique regional design concept that effectively smooths the non-uniform traffic distribution and greatly simplifies the satellite design is employed. The satellite antenna system forms thirty-two 0.33 deg beam on both the uplinks and the downlinks in one design. In another design matched to a traffic model with more dispersed users, there are twenty-four 0.33 deg beams and twenty-one 0.7 deg beams. Detailed system design techniques show that a single satellite producing approximately 5 kW of dc power is capable of handling at least 75% of the postulated traffic. A detailed cost model of the ground segment and estimated system costs based on current information from manufacturers are presented. Author

N81-33369*# Axiomatix, Los Angeles, Calif.
ENGINEERING EVALUATIONS AND STUDIES. REPORT FOR KU-BAND STUDIES, EXHIBIT A Annual Report
James G. Dodds, Gaylord K. Huth, Robert G. Maronde, and Don Roberts 10 Jul. 1981 114 p refs
(Contract NAS9-16067)
(NASA-CR-161018; R8107-1) Avail: NTIS HC A06/MF A01 CSCL 17B

System performance aspects of the Ku band radar communication hardware and investigations into the Ku band/payload interfaces are discussed. The communications track problem caused by the excessive signal dynamic range at the servo input was investigated. The management/handover logic is discussed and a simplified description of the transmitter enable logic function is presented. Output noise produced by a voltage-controlled oscillator chip used in the SPA return-link channel 3 mid-bit detector is discussed. The deployed assembly (DA) and EA-2 critical design review data are evaluated. Cross coupling effects on antenna servo stability were examined. A series of meetings on the acceptance test specification for the deployed assembly is summarized. J.D.H.

N81-33370# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
UNDERWATER COMMUNICATION. FOA-STU PROJECT 4: MARITIME TECHNOLOGY [UNDERVATTENSKOMMUNIKATION. FOA-STU PROJECT 4 - HAVSTEKNIK]
Lars Goetherstroem, Bengt Kleman, Rune Lindquist, and Tore Pentelius Apr. 1980 66 p refs In SWEDISH
(FOA-C-30185-E1-E2-E3) Avail: NTIS HC A04/MF A01

Technological forecasts for underwater communication by acoustical, optical, or radio techniques are summarized. Results on transmission by the various means were evaluated under different hypotheses for the aqueous milieu. Technological possibilities, the need for underwater communications in assorted applications, and a practical assessment of the potential for realization are considered. Conclusions lead to a proposal for a series of development projects. Author (ESA)

N81-33371# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF A VOICE FUNNEL SYSTEM Quarterly Technical Report, 1 Aug. - 31 Oct. 1980
R. D. Rettberg Aug. 1981 33 p refs
(Contract MDA903-78-C-0356; ARPA Order 3653)
(AD-A103217; BBN-4666; QTR-9) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Quarterly Technical Report covers work performed during the period noted on the development of a high-speed interface, called a Voice Funnel, between digitized speech streams and a packet switching communications network. Author (GRA)

N81-33372# Electronics Research Lab., Adelaide (Australia).
IONOSPHERIC TRANSEQUATORIAL RADIO WAVE GUIDANCE AT VHF
C. Winkler Jan. 1981 37 p refs
(AD-A103417; ERL-0181-TR; AR-002-541) Avail: NTIS HC A03/MF A01 CSCL 20/14

There has been a continuing interest in the use of the VHF band to provide communication channels which supplement those of the more conventional but congested HF band. The availability of these supplementary channels for large range transequatorial circuits was first reported by radio amateurs and studies of the phenomenon were largely experimental. The physical mechanisms involved in producing these channels have been and still are poorly understood. It is the purpose of this report to lay down the elements of a simple theory to explain the large signal strengths observed on these circuits and to describe the results of a computer model used to calculate them. GRA

N81-33373# Hughes Aircraft Co., El Segundo, Calif. Advanced Programs Div.
AIRCRAFT TARGET VIEW DETERMINATION FOR METHOD OF MOMENTS IDENTIFICATION Final Report, Oct. 1980 Jun. 1981

George A. Ioannidis, Arie Berman, and Charles P. Dolan Jun. 1981 86 p refs
(Contract N00014-80-C-0940)
(AD-A103483; HAC-FR-81-23-836) Avail: NTIS HC A05/MF A01 CSCL 17/9

In this investigation the Hughes Aircraft Company studied the use of structural, syntactic and statistical pattern recognition techniques for the automatic determination of target view in ISAR images of aircraft targets to be used in the automatic classification of these targets. Author (GRA)

N81-33374# Rome Air Development Center, Griffiss AFB, N.Y. Electromagnetic Sciences Div.
HEIGHT-GAIN ATLAS FOR AN ELEMENTAL VERTICAL ELECTRIC DIPOLE ABOVE A FLAT EARTH
John L. Heckscher and Eli J. Tichovolsky (ARCON Corp., Waltham, Mass.) Mar. 1981 344 p refs
(AF Proj. 2305)
(AD-A103463; RADC-TR-81-39) Avail: NTIS HC A15/MF A01 CSCL 08/14

The complex height-gain for an infinitesimal vertical electric dipole (VED) above each of five homogeneous flat surfaces representative of sea water, well-conducting earth, poorly conducting earth, fresh water, and ice is calculated at 0.1, 1, 10, and 100 MHz for selected ranges. The amplitude and phase of the three cylindrical electromagnetic field components are given for source elevations of 0, 3/4, and 3/2 wavelengths in sets of 36 tables and 48 figures for each of the five types of surfaces. Author (GRA)

N81-33375# Signatron, Inc., Lexington, Mass.
ADAPTIVE ANTENNA CONTROL (AAC) PROGRAM, REVISION Executive Summary, Jun. 1976 - Mar. 1980
Peter Monsen and Steen A. Parl Jun. 1981 61 p refs
(Contract DAAB07-76-C-8085; DA Proj. 1X7-63707-D2-45)
(AD-A103385; CSA-76-8085-7) Avail: NTIS HC A04/MF A01 CSCL 17/2

A theoretical and empirical investigation of angle diversity for application on Defense Communications System (DCS) tropospheric scatter communication links has been completed. This report summarizes the principal areas of this investigation. The major results are: Development of a new propagation prediction model applicable at frequencies up to 5 GHz. Development of a modem prediction model for calculating the bit error rate and fade outage on a fading multipath channel for the MD-0918/GRC modem. A trade-off analysis to determine the optimum angle diversity system. Design and development of a 4.4 - 5.0 GHz (C-Band) angle diversity feedhorn which gives a beam separation within about 1/2 dB of optimum. Theoretical and empirical evidence that angle diversity has a performance advantage over frequency diversity. Discovery of reduced correlation effects in angle diversity when wideband signals are employed. Development of a methodology and a statistical base for development of future angle diversity systems. GRA

N81-33376# Naval Postgraduate School, Monterey, Calif.
EXAMINATION OF VOICE RECOGNITION SYSTEM TO FUNCTION IN A BILINGUAL MODE
D. E. Neil and T. Anderson Mar. 1981 23 p refs
(AD-A103280; NPS55-81-004) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report describes an experiment in which bilingual subjects (German/English) were used to examine the capability of Threshold Technology T600 voice recognition system to function in a bilingual mode. Results suggested that the system functioned equally well in either language when training and testing was in one language. However, significant degradation was observed when training and testing was bilingual in nature. Author (GRA)

N81-33377# Naval Research Lab., Washington, D. C. Radar Analysis Branch.
RADAR COMMUNICATIONS Interim Report
B. H. Cantrell, J. O. Coleman, and G. V. Trunk 26 Aug. 1981 19 p refs
(XF1215104)
(AD-A103396; NRL-8515) Avail: NTIS HC A02/MF A01 CSCL 17/2

Means of communicating through a radar without significantly altering its performance are described. A number of design alternatives such as radar type, antennas, transmitters, frequency diversity, message relays, channel allocations, and modems are considered, and recommended communication and radar-intermesh procedures are given. A demonstration radar-communication system under construction is outlined. In addition, ways of effectively using a radar-communication system are explored. Finally, a planned demonstration of the communication of surveillance-radar data between two sites on the Chesapeake Bay using radar communication is described. Author (GRA)

N81-33378# Naval Research Lab., Washington, D. C. Electromagnetic Branch.
SYNTHESIS OF TAYLOR AND BAYLISS PATTERNS FOR LINEAR ANTENNA ARRAYS Interim Report
J. P. Shelton 31 Aug. 1981 20 p refs
(SF12141491)
(AD-A103534; NRL-8511) Avail: NTIS HC A02/MF A01 CSCL 09/5

The history of synthesis techniques for designing linear antenna arrays with low sidelobe patterns is reviewed briefly, and the limitations that are encountered with very low sidelobes and/or small arrays are pointed out. Taylor's continuous aperture synthesis procedure is outlined, and a technique for transforming it for application to a discrete array is described. Discrete-array design equation for Taylor and Bayliss synthesis procedures are given. A set of programs for use on a programmable calculator are presented. Author (GRA)

N81-33379# Naval Research Lab., Washington, D. C. Radar Analysis Branch.
ELIMINATION OF SHORT PULSE INTERFERENCE IN PULSE COMPRESSION RADARS Interim Report
J. D. Wilson 3 Sep. 1981 15 p refs
(AD-A103533; NRL-8507) Avail: NTIS HC A02/MF A01 CSCL 17/9

Preliminary to a study on environmental mapping based on real data, a simulation was developed to study short pulse interference and its effect on detection in a pulse compression radar. A simulation was needed because the available data were recorded after the pulse compression network. This is too late to eliminate short pulse interference; it must be detected and eliminated prior to pulse compression. The simulation also treats the problem of removing clutter and short pulse interference when both are present. The simulation involved a signal of approximately the same level as the noise, short pulse interference peaking 40 dB above the noise, and clutter with average level the same as the peak level of the short pulse interference. With these levels, either short pulse interference of clutter would inhibit detection, but prepulse compression blanking of the interference and postpulse compression cancellation of the clutter allowed detection of the target signal. Author (GRA)

N81-33380# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PHASE 2 NETTED RADAR DEMONSTRATION
G. H. Knittel 21 Oct. 1980 29 p refs
(Contract F19628-80-C-0002; ARPA Order 3391)
(AD-A103684; TT-42; ESD-TR-81-271) Avail: NTIS HC A03/MF A01 CSCL 17/9

This Project Report describes the system configuration which is being used for the Phase II Netted Radar Demonstration currently under way at Fort Sill, Oklahoma. A brief description of the demonstration scenarios is also included. Author (GRA)

N81-33381# Lincoln Lab., Mass. Inst. of Tech., Lexington.
STATISTICAL MULTIPLEXING OF SPEECH IN HYBRID INTEGRATED NETWORKS
Theodore Bially and Robert Berger 16 Jun. 1981 24 p refs
(Contract F19628-80-C-0002)
(AD-A103543; TR-574; ESD-TR-81-152) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report describes a technique for achieving TASI- or DSI-like operation in hybrid integrated networks. End-to-end voice circuits are established separately for individual talkspurts along routes that are determined at dial-up and fixed for the duration of a conversation. The packet handling capability of the hybrid system is used for high-priority internode data communication regarding the onset and termination of speaker activity. Subjects

discussed include trade-offs between voice delay, cutout fraction and bandwidth efficiency that can be built into the nodal switching strategies. Analysis and simulation results are presented for cutout fraction versus voice delay in a talkspurt switching node with elastic buffering; the amount of buffer space needed as functions of TASI advantage and number of voice trunks per link; the probability of talkspurt buffering and average talkspurt delay. The report concludes with brief discussions of system vulnerabilities with respect to control errors and the compatibility of the concept with variable voice bit rate flow control schemes. Author (GRA)

N81-33382# Naval Ocean Systems Center, San Diego, Calif.
SIGNALING TECHNIQUES FOR UNDERWATER ACOUSTICS COMMUNICATIONS. TONAL AND SPREAD SPECTRUM FREQUENCY SHIFT KEY SYSTEMS ARE COMPARED Final Report, Oct. 1979 - Oct. 1980
L. E. Hoff 6 Jun. 1981 47 p refs
(AD-A104019; NOSC/TR-649) Avail: NTIS HC A03/MF A01 CSCL 17/2

This study compares two sophisticated signaling schemes to compensate for distortions in underwater acoustic channels, where the channel rate of change approaches the reciprocal of the multipath time spread. The first scheme uses tonal pulses much longer than the channel multipath spread. The second (commonly called RAKE) uses spread spectrum pulses to resolve the multipath and an adaptive receiver to combine the multipath echoes coherently. Analysis shows that the RAKE scheme (1) performs considerably better for slowly fading channels and (2) can use a smaller decision interval and can therefore tolerate higher fade rates. Author (GRA)

N81-33383# Optical Sciences Co., Placentia, Calif.
STRATEGIC LASER COMMUNICATIONS UPLINK ANALYSIS Interim Report, 12 Sep. 1980 - 15 Nov. 1981
David L. Fried and Glenn A. Tyler Griffiss AFB, N.Y. RADC Jul. 1981 112 p refs
(Contract F30602-80-C-0305; ARPA Order 4021)
(AD-A104173; DR-207; RADC-TR-81-186) Avail: NTIS HC A06/MF A01 CSCL 17/2

The work presented in this report is concerned with two distinct matters. Each of these is covered in one of the two chapters of this volume. Chapter 1 treats the subject of anisoplanatism in ordinary adaptive optics. The subject of Chapter 2 is the development of an estimate of pulse laser backscatter signal from the upper atmosphere. GRA

N81-33384# Rome Air Development Center, Griffiss AFB, N.Y.
BASIC DESIGN PRINCIPLES OF ELECTROMAGNETIC SCATTERING MEASUREMENT FACILITIES
Richard B. Mack Mar. 1981 81 p refs
(AF Proj. 2305)
(AD-A103943; RADC-TR-81-40) Avail: NTIS HC A05/MF A01 CSCL 14/2

Typical experimental configurations that are used for measuring radar scattering are analyzed with simplified forms of basic electromagnetic principles to show how the experimental facility design affects measurement capability and the accuracy of the measured results. The discussion includes effects of a nonuniform field over the model space, the measurement distance from the scattering model, multiple reflections from walls of a chamber or from nearby objects, interference from model support structures, and the effects of forward scattering. Guiding principles are developed for choosing and designing the important components of a scattering measurement facility such as the transmit/receive antennas, the RF power sources, model support structures, and transmission line component assemblies so that measurement accuracy is maximized. Simple experimental procedures are given for evaluating a given measurement setup. Emphasis in the report is placed on illustrating the principles with numerical examples. Author (GRA)

N81-33385# Rome Air Development Center, Griffiss AFB, N.Y.
EFFECTS OF ENERGETIC PARTICLE EVENTS ON VLF/LF PROPAGATION PARAMETERS, 1978
John P. Turtle, John E. Rasmussen, and Wayne I. Klemetti Mar. 1981 131 p refs
(AF Proj. 4600)
(AD-A103945; RADC-TR-81-82) Avail: NTIS HC A07/MF A01 CSCL 20/14

This report provides a summary of disturbance effects of energetic particle events on VLF/LF propagation parameters as observed by the USAG High Resolution VLF/LF Ionosonder in northern Greenland. Disturbance effects on ionospheric reflectivity parameters, including reflection heights and coefficients, are presented along with data from a riometer, a magnetometer, and satellite particle detectors. Author (GRA)

N81-33386# Rome Air Development Center, Griffiss AFB, N.Y.
AUGMENTED ELECTRIC AND MAGNETIC-FIELD INTEGRAL EQUATIONS
Arthur D. Yaghjian Mar. 1981 54 p refs
(AF Proj. 2305)
(AD-A103946; RADC-TR-81-45) Avail: NTIS HC A04/MF A01 CSCL 20/14

Augmented electric and magnetic-field integral equations, which preserve the basic simplicity, solution capability, and pure electric and magnetic-field character of the original integral equations, are introduced to eliminate the spurious resonances from the exterior solution of the original integral equations. The exact dependence of the original and augmented integral equations on the geometry of the principal area (self patch) which excludes the singularity of their kernels is also determined; and alternate forms for the integral equations are provided that avoid integrals dependent upon the geometry of the principal area. Numerical results obtained for scattering from the perfectly conducting cube, sphere, and infinite circular cylinder confirm the theoretically predicted result that the augmented integral equations eliminate the spurious resonances for all perfectly conducting scatterers except the sphere. Author (GRA)

N81-33387# SRI International Corp., Menlo Park, Calif.
EATS AND APATS TELEMETRY ANTENNA PERFORMANCE COMPARISON IN A BALLISTIC MISSILE TERMINAL AREA SUPPORT ROLE Final Report, Feb. - Jun. 1981
J. F. Cline and E. G. Blackwell Jun. 1981 55 p
(Contract DASG60-80-C-0069)
(AD-A104108; SRI-1715-81-FR-88) Avail: NTIS HC A04/MF A01 CSCL 09/6

A comparative analysis was made of the performance of the U.S. Navy EATS multibeam phased array telemetry antenna, currently under development by Pacific Missile Test Center and the planned APATS antenna intended for use by the U.S. Air Force ARIA Fleet. The comparison was made in the context of a ballistic missile terminal area test support role for the collection of telemetry data from MK-4 and MK-12 instrumented RVs during reentry. In this comparison, two levels of upgrade were examined for the EATS antenna, one as a minimum required upgrade (dual-polarization), and the other as an upgrade with dual-polarization and increased elevation scan angle commensurate with the APATS specification. Study findings indicate that the second EATS upgrade option results in telemetry collection performance essentially equal to that of the APATS. RV telemetry blackout (SNR $<$ 13 dB) for the EATS upgraded antenna lasted slightly longer than the blackout of the APATS antenna. Blackout is relatively unimportant in the MK-4 application, but may be more consequential in the MK-12 application. The minimum EATS antenna upgrade (dual-polarization) does not perform well for ballistic missile telemetry support, so that the full upgrade is indicated for the EATS telemetry antenna in this mission role. GRA

N81-33388# SRI International Corp., Menlo Park, Calif.
PROPAGATION EFFECTS IN DISTURBED ENVIRONMENTS Final Report, 30 Nov. 1979 - 31 Dec. 1980
Charles L. Rino 1 Jan. 1981 39 p refs
(Contract DNA001-80-C-0009)
(AD-A104022; DNA-5637F) Avail: NTIS HC A03/MF A01 CSCL 20/14

Radio beacon diagnostics are still the least expensive means of obtaining data on naturally occurring and artificially induced striations. To exploit this capability fully, we develop the theory for interpreting rocket-beacon data when the velocity component along the line of sight to the receiver is much larger than the transverse component. A simple and direct relationship is shown to exist between the beacon-phase spectrum and the one

dimensional in-situ spectrum that does not involve any unknown parameters, such as the path length within the disturbance. A model is also developed for computing the Doppler spectrum for the usual situation in which the transverse velocity component dominates. Author (GRA)

N81-33389# Atlantic Research Corp., Alexandria, Va.
INTRASYSTEM ANALYSIS PROGRAM (IAP) STRUCTURAL DESIGN STUDY Final Technical Report, 1977 - 1981
William G. Duff, Larry D. Thompson, Harvey K. Schuman, and Donald R. Pflug Griffiss AFB, N.Y. RADC Jun. 1981 235 p refs
(Contract F30602-77-C-0150; AF Proj. 2338)
(AD-A103899; ARC-53-6111; RADC-TR-81-133) Avail: NTIS HC A11/MF A01 CSCL 20/3

The Intrasystem Analysis Program is a collection of computer codes used in analyzing the electromagnetic compatibility of aircraft, space/satellite, and ground-based systems. The IAP is reconsidered here in terms of an overriding framework. The concept of a procedure is introduced whereby emitter, receptor, and coupling models are grouped and interfaced for efficient use in EMC analysis. All aspects impacting the construction of a procedure are considered in detail. These include data; task; systems equations; emitter, receptor, and coupling models; computer resources; accuracy; and intended user. The attributes of many existing, or soon to be available, coupling models are tabulated for ready reference during the construction of procedures. The wide range of problems amenable to these coupling models is made apparent through grouping into 'basic' and 'combined' categories. Author (GRA)

N81-33390# Ball Aerospace Systems Div., Boulder, Colo.
ADVANCED MICROSTRIP ANTENNA DEVELOPMENT. VOLUME 1: TECHNOLOGY STUDIES FOR AIRCRAFT PHASED ARRAYS Final Report, Apr. 1979 - Jun. 1980
Gary G. Sanford Jun. 1981 75 p refs
(Grant DOT-TSC-1397)
(AD-A103837; FAA-EM-80-11-Vol-1; TSC-FAA-80-15-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 09/1

Work has continued on improvement of microstrip phased-array antenna technology since the first microstrip phased-array was flight-tested during the FAA 1974-1975 ATS-6 test program. The present development has extended this earlier work in three areas: the microstrip radiating elements, the array configuration, and the control circuitry. The effort has been successful in developing important new phased-array techniques. These techniques were demonstrated with working hardware, but a complete array was not within the scope of the program. Radiating elements with broad beamwidths were required to permit steering the array to angles near endfire. The most significant improvement was the development of a microstrip crossed-slot element. Dual-band or broad-band elements were developed to permit operation in both the receive and transmit bands. Several approaches were experimented with, the most promising of which was the use of stacked crossed-slot elements. This achieves broad beamwidth and dual-band operation in a compact device. Static arrays for end-fire operation were investigated, and a 4x4 array demonstrated promise for this application. Several phase shifters were developed; the three-bit switched-line phase shifters gave excellent performance. GRA

N81-33391# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
VHF ELECTRICAL PROPERTIES OF FROZEN GROUND NEAR POINT BARROW, ALASKA
Steven A. Arcone and Allan J. Delaney Jun. 1981 25 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A103735; CRREL-81-13) Avail: NTIS HC A02/MF A01 CSCL 09/1

Electrical properties of frozen ground were measured using radio frequency interferometry (RFI) in the very high frequency (VHF) radiowave band. Ice-rich organic silts and sands and gravels of variable ice content were investigated during early April of both 1979 and 1980. Frequencies between 10 and 150 MHz were used with best results obtained between 40 and 100 MHz. Surface impedance and magnetic induction techniques were also used to obtain an independent measure of low frequency resistivity and to obtain a separate control on vertical inhomogeneity. Soil samples were tested for organic and water content. The dielectric constants determined for the ice-rich organic silts ranged from 4.0 to 5.5 while those for the sands and gravels were about 5.1. Dielectric loss was due to d.c. conduction and was very low for the silts but significant for the sands and gravels. The higher values for the sands and gravels were most likely due to the higher concentrations of salt that are reported to exist in the old beach ridges in this region. All the RFI measurements are believed to be indicative of only the first few meters of the ground although the radiowaves could penetrate to tens of meters. Author (GRA)

N81-33392# Network Analysis Corp., Vienna, Va.
COMPUTER B (NAS-NAS) COMMUNICATIONS SUPPORT Final Report
Jul. 1981 171 p refs
(Contract DOT-FA79WA-4335)
(AD-A104145; NAC/FR-303F/01; FAA-RD-81-68) Avail: NTIS HC A08/MF A01 CSCL 17/2

An analysis has been performed to determine the feasibility and desirability of incorporating into NADIN the message traffic currently serviced by the Computer B (NAS-NAS) Network. The use of NADIN to support NAS-NAS communications was found to be feasible and cost-effective. The most attractive approach to such support was found to be the enhancement of the NADIN architecture, using packet-switching technology, to provide virtual circuit and alternate routing capabilities between all NADIN backbone modes. The results of this analysis are to serve as inputs to other tasks under this contract that will investigate a consolidated NADIN enhancement approach for supporting future FAA data communications requirements, including enhancements to support the replacement of FAA's enroute computer system, and the Remote Maintenance Monitoring System. Author (GRA)

N81-33393# Harris Corp., Melbourne, Fla.
TENT SHAPED PHASED ARRAY Interim Report
C. A. Chuang Griffiss AFB, New York RADC Jun. 1981 70 p refs
(Contract F19628-79-C-0173; AF Proj. 4600)
(AD-A103927; RADC-TR-81-116) Avail: NTIS HC A04/MF A01 CSCL 09/5

This interim report presents the study results of a tent shaped phased array SHF aircraft antenna for Satellite Communications. The antenna consists of four planar phased arrays and has a low profile streamlined configuration. The tent array provides electrical scanning over a hemisphere and is capable of high power transmission. The design of the array is a trade-off of the key parameters including antenna coverage, gain, aerodynamic impact, high power transmission, and array packaging. The detailed design considerations of these parameters are presented. A design procedure is given to derive an optimum tent array configuration. The design of a 20 dB gain tent array is discussed. This array consists of square waveguide elements, septum polarizers, ferrite and diode phase shifters, a unique feed network, and a microprocessor for array control. The array depth has a significant impact on the aerodynamic effects and array packaging. The development and design of compact array components to reduce the array depth and to provide high power capability is the key factor to the successful application of the tent array. The extension of the 20 dB gain design to a 30 dB gain array is also included. A breadboard planar array, to test the performance of the array and components, and verify the concept of the tent shaped phased array, is being implemented in this effort. Author (GRA)

N81-33394# Mitre Corp., Bedford, Mass.
DATA TRANSFER MINIMIZATION FOR COHERENT PASSIVE LOCATION SYSTEMS
Duane J. Matthiesen and G. D. Miller Jun. 1981 45 p refs
(Contract F19628-81-C-0001; AF Proj. 4110)
(AD-A104087; M81-7; ESD-TR-81-129) Avail: NTIS HC A03/MF CSCL 17/9

Coherent passive location systems derive their optimal detection and location estimation capabilities by cross-correlating signal segments observed at physically separate receivers. They are inherently robust. Performance characteristics and system requirements including observation intervals, data transfer, Doppler

compensation, and adaptive thresholding are presented for the fundamental two-receiver case. For many potential systems, particularly those that must operate from mobile platforms, techniques that minimize data transfer requirements while maintaining reliable system performance must be carefully considered during system design. Performance losses of several candidate data transfer reduction techniques of varying complexity are compared with minimal bounds obtained from rate distortion theory. Author (GRA)

N81-33395# Mitre Corp., Bedford, Mass.
PROCEEDINGS OF THE MILITARY COMMUNICATIONS SYSTEM CONTROL SYMPOSIUM
Stephen Harris, ed. and James Heller, ed. Nov. 1980 140 p refs
(AD-A103830; M80-30) Avail: NTIS HC A07/MF A01 CSCL 17/2

Contents: Perspective on Communications System Control, Navy Force Coordination and the Requirements for Communications Network Management, On the Functions of a Network Management Agency, Improved Control and Technical Management of DCS Theater Assets Under Crisis and Wartime Conditions, Survivability Performance of MX Communication System, System Control for the Tactical/Strategic Interface, Tactical Circuit-Switched Network Control, Systems Control in Tactical Digital Communications Systems - a Study in Distributed Control, the NATO III Satellite Communications Control System, Network Control in NATO Integrated Communications Systems - Stage I, Evolution of Control in the Defense Satellite Communication System, System Control Considerations for Next Generation DCS Switches, Evolving Approaches to System control in the Defense Communications Systems(DCS), and Network control and the CRM Make Possible Automated Digital Patching. GRA

N81-33396# Ohio State Univ., Columbus. ElectroScience Lab.
MOMENT METHOD SOLUTIONS FOR RADIATION AND SCATTERING FROM ARBITRARILY SHAPED SURFACES Ph.D. Thesis
Pravit Tulyathan Feb. 1981 107 p refs
(Contract N00014-78-C-0049)
(AD-A103965; AD-E450007; ESL-712692-1) Avail: NTIS HC A06/MF A01 CSCL 20/14

General quadrilateral surface-patch, thin-wire, and wire/plate attachment modes are developed for the moment method solution of electromagnetic scattering and antenna problems. The basic theory along with the techniques for accurate and efficient evaluation of the impedance elements are described. The methods to automatically set up the surface-patch modes for a polygonal plate are given. Numerical results for various antennas and scatterers are compared with other theoretical results and measurements. Using techniques developed in this work, the microstrip antenna is analyzed and the numerical results are also presented. GRA

N81-33397# Syracuse Univ., N. Y.
ELECTROMAGNETIC SHIELDING EFFECTIVENESS FOR ISOTROPIC AND ANISOTROPIC MATERIALS Phase Report, Nov. 1978 - Mar. 1980
J. L. Allen (Univ. of South Florida, Tampa) Jun. 1981 70 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A104172; RADC-TR-81-162) Avail: NTIS HC A04/MF A01 CSCL 11/4

'ABCD' and 'Scattering' matrix analysis techniques for determining shielding effectiveness of isotropic and anisotropic multilayered shields are presented. These techniques are well-suited to computer implementation. A variety of materials fit the models used including advanced composite materials (e.g., fiber-reinforced epoxies where the fibers are 'long' and 'oriented'), conductive filled thermoplastics (randomly oriented, chopped fibers or other conductive particles) and the more common metallic shields. Advanced composite materials are now widely used as structural and surface components in aircraft and spacecraft. Chopped-fiber-filled structural foams are used as enclosures for electronic equipment. Such applications require accurate assessment of electromagnetic shielding effectiveness. GRA

N81-33398# Bosch (Robert) G.m.b.H., Darmstadt (West Germany). Geschaeftsbereich Fernsehanlagen.
VIDEO TRANSMISSION WITH REDUCED INFORMATION FLOW. SYSTEM WITH SOURCE CODING FOR TRANSMISSION OF COLOR VIDEO SIGNALS IN ACCORDANCE WITH THE CCIR 625 LINE STANDARD Final Report
Juergen Heitmann, Hans Peter Maly, Gerhard Wischermann, and Juergen Mueller Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-146; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,20

Bit rate reduction of a color television signal by irrelevancy and redundancy reduction techniques to allow its transmission over a third hierarchy channel of a PCM network was studied. It is noted that the digital source encoding should comply with the CCIR 625 line standard and not noticably influence the picture quality. The proposed solution consists of: (1) a four bit DPCM for each of the television signal components; (2) sub-Nyquist sampling frequency for the luminance signal with harmonic ratio to the chrominance sampling frequencies; and (3) adaptive quantizing as well as intra and interframe filtering of the chrominance signals. Author (ESA)

N81-33399# Aalborg Univ. (Denmark). Inst. for Elektroniske Systemer.
DOPPLER SPECTRUM OF SINGLE AUTOMOBILES
J. Bach Andersen Apr. 1980 28 p refs
(R-80-4) Avail: NTIS HC A03/MF A01

The Doppler spectrum from an extended object illuminated by a finite beam was analyzed. The long duration spectrum is the product of an antenna and an object spectrum, which may lead to significant systematic errors in the determination of velocity. The error probability is larger for short duration spectra. The analysis is applied to speed radars used in law enforcement purposes. Results also indicate the existence of a very wide spectrum, and the errors can be interpreted as a result of moving phase centers. Author (ESA)

N81-33400# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
EXCITATION OF A TEM (TRANSVERSE ELECTROMAGNETIC) CELL BY A VERTICAL ELECTRIC HERTZIAN DIPOLE
Perry F. Wilson, David C. Chang (Colorado Univ., Boulder), and Mark T. Ma (Colorado Univ., Boulder) Mar. 1981 44 p refs
(PB81-207904; NBS-TN-1037) Avail: NTIS HC A03/MF A01 CSCL 14B

The excitation of a transverse electromagnetic (TEM) cell by a vertical electric Hertzian dipole is analyzed where the gap between the septum and side wall is assumed to be small. Approximate expressions for the field distribution and characteristic impedance are derived. These expressions are numerically evaluated for some typical geometries, and good agreement with previously published results is shown. The formation also allows a vertical offset for the septum position, thus offering more flexibility of increasing the size of the test area to accommodate larger pieces of test equipment. GRA

N81-33401# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF ELECTROMAGNETIC FIELD DISTORTION DUE TO A PERFECTLY CONDUCTING RECTANGULAR CYLINDER IN A TRANSVERSE ELECTROMAGNETIC CELL
Motohisa Kanda Apr. 1981 50 p refs
(PB81-209256; NBS-TN-1028) Avail: NTIS HC A03/MF A01 CSCL 14B

The loading effects, i.e., the electromagnetic field distortion caused by an object under test in a transverse electromagnetic cell, are discussed in reference to electromagnetic compatibility. GRA

N81-33402# Institute for Telecommunication Sciences, Boulder, Colo.
THE ROLE OF ELEVATED DUCTING FOR RADIO SERVICE AND INTERFERENCE FIELDS

H. T. Dougherty and E. J. Dutton Mar. 1981 61 p refs (PB81-206138; NTIA-Rept-81-69) Avail: NTIS HC A04/MF A01 CSCL 17B

The manner in which atmospheric stratification can complicate the problems of frequency allocation and radio regulation by inhibiting service fields and enhancing interference fields is categorized. For the United States and its border regions, preliminary contour maps are presented for those parameters associated with the atmospheric layering (ducts) conducive to the propagation of unusually strong UHF and SHF fields over extremely long distances. The parameters of interest are: the percent occurrence of elevated ducts, a minimum trapping frequency, the modified refractivity lapse, the ducting-layer base height, the duct-base height, and the duct-top height. The role of these duct parameters in the prediction of potential interference fields is detailed by engineering formulas and illustrated by numerical examples. GRA

N81-33340# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.

INTRODUCTION TO THE WORKSHOP

A. Sieber *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 13-17 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33342# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

IMAGING RADAR SYSTEMS

F. Schlude *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 29-39 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33343# Canada Centre for Remote Sensing, Ottawa (Ontario).

TRANSFER FUNCTIONS FOR PARTIALLY COHERENT SYSTEMS WITH APPLICATIONS TO SAR

R. Keith Raney *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 41-52 refs Submitted for publication (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33344# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

SEA SURFACE SCATTERING

Richard K. Moore *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 53-61 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33345# Canada Centre for Remote Sensing, Ottawa (Ontario).

WAVE ORBITAL VELOCITY, FADE AND SAR RESPONSE TO AZIMUTH WAVES

R. K. Raney *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 63-70 refs Submitted for publication (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33346# Kansas Univ., Lawrence. Remote Sensing Lab.

A REVIEW OF SURFACE SCATTER THEORIES FOR MODELING APPLICATIONS

A. K. Fung *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 71-82 refs (For primary document see N81-33339 24-31)
(Grants NSF ENG-79-09374; DAAG29-80-K-0018)
Avail: NTIS HC A08/MF A01

N81-33347# Kansas Univ., Lawrence. Remote Sensing Lab.

A REVIEW OF VOLUME SCATTER THEORIES FOR MODELING APPLICATIONS

A. K. Fung *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 83-92 refs (For primary document see N81-33339 24-31)
(Grants NSF ENG-79-09374; DAAG29-80-K-0018)
Avail: NTIS HC A08/MF A01

N81-33348# Marconi Co. Ltd., Chelmsford (England).

SCATTERING THEORY WITH APPLICATION TO SYNTHETIC APERTURE RADAR

S. Rotheram *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 93-98 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33350# Illinois Univ. at Chicago Circle, Chicago. Communications Lab.

OPTIMAL POLARIZATION CONCEPT IN RADAR IMAGING

Wolfgang-M. Boerner *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 129-142 refs Sponsored also by Humboldt Fellowship National Science and Engineering Research Council of Canada and NATO (For primary document see N81-33339 24-31)
(Contracts N00014-80-C-0708; N00014-80-C-0073; Grant DRXR-OPR-P-17227-EL)
Avail: NTIS HC A08/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N81-33403* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TIME DELAY AND INTEGRATION DETECTORS USING CHARGE TRANSFER DEVICES Patent

David H. McCann, (Westinghouse Electric Corp., Baltimore), Marvin H. White, (Westinghouse Electric Corp., Baltimore), and Alfred P. Turly, (Westinghouse Electric Corp., Baltimore) Issued 21 Jul. 1981 7 p Filed 22 Sep. 1978 Supersedes N79-13262 (17 - 04, p 0446) Sponsored by NASA
(NASA-Case-GSC-12324-1; US-Patent-4,280,141; US-Patent-Appl-SN-945043; US-Patent-Class-358-213; US-Patent-Class-358-109) Avail: US Patent and Trademark Office CSCL 09C

An imaging system comprises a multi-channel matrix array of CCD devices wherein a number of sensor cells (pixels) in each channel are subdivided and operated in discrete intercoupled groups of subarrays with a readout CCD shift register terminating each end of the channels. Clock voltages, applied to the subarrays, selectively cause charge signal flow in each subarray in either direction independent of the other subarrays. By selective application of four phase clock voltages, either one, two or all three of the sections subarray sections cause charge signal flow in one direction, while the remainder cause charge signal flow in the opposite direction. This creates a form of selective electronic exposure control which provides an effective variable time delay and integration of three, six or nine sensor cells or integration stages. The device is constructed on a semiconductor sustrate with a buried channel and is adapted for front surface imaging through transparent doped tin oxide gates.

Official Gazette of the U.S. Patent and Trademark Office

N81-33404* National Aeronautics and Space Administration. Pasadena Office, Calif.

PUSH-PULL CONVERTER WITH ENERGY SAVING CIRCUIT FOR PROTECTING SWITCHING TRANSISTORS FROM PEAK POWER STRESS Patent

W. T. McLyman, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 30 Jun. 1981 7 p Filed 22 Jun. 1979 Supersedes N79-26312 (17 - 17, p 2256) Sponsored by NASA
(NASA-Case-NPO-14316-1; US-Patent-4,276,588; US-Patent-Appl-SN-051276; US-Patent-Class-363-56;

US-Patent-Class-363-24) Avail: US Patent and Trademark Office CSCL 09C

In a push-pull converter, switching transistors are protected from peak power stresses by a separate snubber circuit in parallel with each comprising a capacitor and an inductor in series, and a diode in parallel with the inductor. The diode is connected to conduct current of the same polarity as the base-emitter juction of the transistor so that energy stored in the capacitor while the transistor is switched off, to protect it against peak power stress, discharges through the inductor when the transistor is turned on, and after the capacitor is discharges through the diode. To return this energy to the power supply, or to utilize this energy in some external circuit, the inductor may be replaced by a transformer having its secondary winding connected to the power supply or to the external circuit.

Official Gazette of the U.S. Patent and Trademark Office

N81-33405* National Aeronautics and Space Administration. Pasadena Office. Calif.

PN LOCK INDICATOR FOR DITHERED PN CODE TRACKING LOOP Patent

Lansing M. Carson, inventor (to NASA) (Motorola, Inc., Phoenix, Ariz.) Issued 14 Jul. 1981 6 p Filed 6 Mar. 1979 Supersedes N79-18224 (17 - 09, p 1128) Sponsored by NASA (NASA-Case-NPO-14435-1; US-Patent-4,279-018; US-Patent-Appl-SN-017886; US-Patent-Class-364-514; US-Patent-class-331-DIG.2; US-Patent-Class-329-122; US-Patent-Class-375-1) Avail: US Patent and Trademark Office CSCL 09C

In a delay-lock one-delta (+or - 1/2 chip) dithered PN code tracking loop, an indication of lock in the PN code tracking loop is provided by delaying the dithered local PN code by a half chip to produce a +0, -1 dithered PN code that is then multiplied with the received PN-spread IF signal to produce a signal proportional to the correlation of this dithered code offset from the received code. The correlation signal is bandpass filtered, amplified with AGC control, and square-law detected to obtain a dc signal proportional to the degree of correlation. The dc signal is multiplied by the dithering control signal to effectivity substract noise voltage from the lock correlation signal which is then compared with a PN lock status signal.

Official Gazette of the U.S. Patent and Trademark Office

N81-33406*# RCA Solid State Div., Somerville, N.J.

ACCELERATED LIFE TESTING EFFECTS ON CMOS MICROCIRCUIT CHARACTERISTICS Final Report, May 1976 - Dec. 1980

Dec. 1980 102 p

(Contract NAS8-31905)

(NASA-CR-161765) Avail: NTIS HC A06/MF A01 CSCL 09C

The 250 C, 200C and 125C accelerated tests are described. The wear-out distributions from the 250 and 200 C tests were used to estimate the activation energy between the two test temperatures. The duration of the 125 C test was not sufficient to bring the test devices into the wear-out region. It was estimated that, for the most complex of the three devices types, the activation energy between 200 C and 125 C should be at least as high as that between 250 C and 200 C. The practicality of the use of high temperature for the accelerated life tests from the point of view of durability of equipment is assessed. Guidlines for the development of accelerated life-test conditions are proposed. The use of the silicon nitride overcoat to improve the high temperature accelerated life-test characteristics of CMOS microcircuits is described. J.D.H.

N81-33407# Rockwell International Science Center, Thousand Oaks, Calif. Microelectronics Research and Development Center.

MONOLITHIC GaAs OSCILLATOR DEVELOPMENT Final Report, 15 Jul. 1979 - 14 Oct. 1980

D. Decker, W. C. Petersen, and A. K. Gupta Jul. 1981 33 p

(Contract N00014-79-C-0726; NR Proj. 251-041; RF62581801)

(AD-A103478; MRDC41030.1FR) Avail: NTIS HC A03/MF A01 CSCL 09/5

The goal of this program was to develop an 8 GHz monolithic voltage controlled stabilized oscillator on gallium arsenide (GaAs) suitable for monolithic integration with an 8 GHz satellite communications band receiver front-end. The monolithic microwave integrated circuit (MMIC) design is based on microstrip circuitry fabricated on a semi-insulating GaAs substrate with resistivity as high as 10 to the 9th power omega-cm. Active devices (FETs and varactors), bias networks, and microwave circuitry and fabricated on a single GaAs chip. Ion implantation doping technology facilities control of doping densities for optimization of FET and varactor active devices and also permits fabrication of highly planar circuits to achieve superior yields. The monolithic stabilized oscillator fabricated under this program contains a varactor tuned common-drain oscillator, a common-source buffer amplifier for gain and load isolation, and an active output coupler which provides a sample output to facilitate phase locked operation. This report is organized as follows. Section 2.0 describes the program objectives, the design approach, and a detailed circuit design. A discussion of the fabrication technology is contained in Section 3.0, followed by test results and further in Section 4.0. Finally, Section 5.0 provides a summary and recommendations for work under Phase 2 of this program.

Author (GRA)

N81-33408# Lincoln Lab., Mass. Inst. of Tech., Lexington.

AUTOMATED PHASE/AMPLITUDE EHF MEASUREMENT SYSTEM

Bing M. Potts 28 May 1981 30 p refs

(Contract F19628-80-C-0002; AF Proj. 2029)

(AD-A103547; TR-560; ESD-TR-81-99) Avail: NTIS HC A03/MF A01 CSCL 14/2

An automated, computer-controlled measurement system capable of conducting transmission and reflection measurements on components over the 40 to 47 GHz frequency range is described. The measurement system utilizes harmonic mixing in conjunction with a phase locked, dual channel receiver to downconvert signals in the 7 GHz bandwidth to a lower intermediate frequency (1 KHz) where phase and amplitude measurements are made. The system is capable of operating over a dynamic range in excess of 50 dB when used with an EHF source producing a minimum -10 dBm output. Following a description of the system and its operation, some performance characteristics are presented. The measurement system accuracy is demonstrated using two types of reference standards: (1) a rotary vane attenuator for the transmission measurements, and (2) a set of reduced-height waveguide VSWR standards for the return loss measurements. Results obtained using these standards have indicated that measurement accuracies of 0.25 dB and 3 deg are achievable over a 50 dB dynamic range.

Author (GRA)

N81-33409# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.

GaAs MONOLITHIC MICROWAVE SUBSYSTEM TECHNOLOGY BASE Final Technical Report, 1 Apr. 1979 - 31 May 1980

J. G. Oakes, J. E. Degenford, M. Cohn, M. C. Driver, and R. G. Freitag Dec. 1980 152 p refs

(Contract N00014-78-C-0268; DARPA Order 3543; NR Proj. 251-028)

(AD-A103840; Rept-81-0571) Avail: NTIS HC A08/MF A01 CSCL 09/1

During this reporting period, the effort was primarily directed toward increasing the power output per unit of gate width and exploiting the previously developed direct selective ion implantation technology to design, fabricate and evaluate successive iterations of multistage monolithic power amplifiers. Improvements in GaAs materials and FET device design and processing have resulted in increases in FET output power per unit of gate width. Values of 0.7 watts per mm have been achieved, (typical values between 0.6 and 0.7 watts per mm). A device power output of 1.6 watts CW has been measured for an eight cell 2400 micron gate width FET. The design of wide-band multistage power amplifiers, that observe area conserving constraints necessary for economical monolithic fabrication, is a formidable task. An analysis and optimization procedure which solves this problem has been developed and demonstrated by the design of a wide-band two-stage monolithic power amplifier that yielded a power output of 28 dBm + or 0.7 dB over the frequency range from 5.7 to 11.0 GHz. Power outputs of greater than 30 dBm have been achieved over narrower bandwidths. GRA

N81-33410# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.

MNOS BORAM MANUFACTURING METHODS AND TECHNOLOGY PROJECT Interim Technical Report, Apr. 1980 - May 1981

J. E. Brewer and J. W. Dzimianski Fort Monmouth, N.J. Army Electronics Research and Development Command Aug. 1981 57 p

(Contract DAAK20-80-C-0259)

(AD-A104042; Rept-81-0535) Avail: NTIS HC A04/MF A01 CSCL 09/2

A manufacturing methods project has been initiated to establish production techniques for 8K-bit metal-nitride-oxide semiconductor (MNOS) block-oriented random-access memory (BORAM) devices, to establish the performance adequacy and reproducibility of such MNOS BORAM devices for military environments, and to demonstrate a production rate of 500 multicuip MNOS BORAM hybrid circuits per month. During the past reporting period the project has focused on definition of tests, development of test equipment, and preparation of test programs. In particular, studies have been conducted to determine the feasibility of using an automated retention projection test as part of a manufacturing screen. Author (GRA)

N81-33411# Harry Diamond Labs., Adelphi, Md.

AN EVALUATION OF CURRENTLY USED PRINTED CIRCUIT BOARD MATERIALS AND PROCESSES

Adolphe J. Edwards May 1981 19 p Sponsored by Army

(AD-A103990; HDL-TM-81-17) Avail: NTIS HC A02/MF A01 CSCL 09/5

A project was undertaken to evaluate currently used printed circuit board materials and processes. The procedure was to use combinations of the different types of commercially available photoresists and etchants to determine their fine line production capabilities. In the evaluation, the line widths were measured and compared with those of the artwork; also, the extent of undercutting was measured. From these data, a minimum line width limit was determined for each photoresist/photoresist thickness/etchant combination. Author (GRA)

N81-33412# Stanford Univ., Calif. Labs. of Physics.

TO STUDY THE RF PROPERTIES OF SUPERCONDUCTING A15 COMPOUNDS Final Technical Report

M. R. Beasley, T. H. Geballe, and H. A. Schwettman Jul. 1981 26 p refs

(Contract N00019-79-C-0618)

(AD-A103723) Avail: NTIS HC A03/MF A01 CSCL 20/3

The purpose of the work was to study the low RF-field loss of A15 superconducting compounds. This type of superconducting material has potential for application to the construction of microwave energy storage cavities whose energy can be dumped in a very short time so as to produce a very large microwave power pulse. An apparatus, using a calorimetric technique, was developed to measure the surface resistance of small-area superconducting samples deposited on sapphire substrates. Both a Nb and a Nb3Sn sample (the latter in the A15 structure) were prepared, characterized and measured. These initial measurements revealed additional losses that are most likely due to the region near the superconductor-sapphire interface. Measurements of the superconducting transition temperature were made as a function of film thickness to study the effect of the interface. The interface losses can be avoided in practice, and in our measurements they can be circumvented by employing a circularly cylindrical geometry which shields the interface region from the rf fields. In the course of developing the surface resistance apparatus, dielectric loss measurements were made on pure sapphire samples. GRA

N81-33413# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.

SURFACE PHYSICS AND CHEMISTRY OF ELECTRICAL CONTACT PHENOMENA Annual Report, 1 Oct. 1980 - 30 Sep. 1981

Richard W. Vook and Bhaj Singh 1 Sep. 1981 53 p refs

(Contract N00014-74-C-0763; NR Proj. 091-015)

(AD-A104034; Rept-81-1) Avail: NTIS HC A04/MF A01 CSCL 20/3

The objectives of this research can be divided into two parts. One part was concerned with the improvement of the slip ring-brush assembly, additions of a prototype debris collection system and a stainless steel gas handling system to introduce dry and wet CO2 environments in the vacuum system. The other part of our research dealt with investigations carried out on the microstructural characterization of rotating Cu-Cu electrical contacts in vacuum and wet CO2 environments. The main achievements and results of the past year are listed in the appendices as papers published and accepted for publication. The work mainly consists of investigating the chemical, electrical and wear properties of the rotating interface between OFCH Cu slip ring and two high purity Cu wire brushes in situ in ultra high vacuum and in one atmosphere of wet CO2. The chemical composition of the slip ring surface was determined by Auger electron spectroscopy (AES). The contact resistance was measured by a potentiometric four point probe technique while the wear properties of the interface and the morphology of the debris were studied by frictional force, scanning electron microscopy (SEM), transmission electron diffraction (TED), and X-ray diffraction (XRD) measurements. Author (GRA)

N81-33414# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.

INVESTIGATION OF A FAMILY OF POWER CONDITIONERS INTEGRATED INTO A UTILITY GRID: CATEGORY 1 Final Report

P. Wood and R. P. Putkovich Jul. 1981 107 p Prepared for Sandia National Lab.

(Contracts DE-AC04-76DP-00789; DE-AC02-79ET-29359)

(DE81-029394; SAND-81-7030) Avail: NTIS HC A06/MF A01

Technical issues regarding ac and dc interface requirements were studied. A baseline design was selected to be a good example of existing technology which would not need significant development effort for its implementation in residential solar photovoltaic systems. Alternative technologies are evaluated to determine which meet the baseline specification, and their costs and losses are evaluated. Areas in which cost improvements can be obtained are studied, and the three best candidate technologies--the current sourced converter, the HF front end converter, and the programmed wave converter--are compared. It is concluded that the designs investigated will meet, or with slight improvement could meet, short term efficiency goals. Long term efficiency goals could be met if an isolation transformer were not required in the power conditioning equipment. None of the technologies studied can meet cost goals unless further improvements are possible. DOE

N81-33415# California Univ., Berkeley. Lawrence Berkeley Lab.

ENERGY SAVINGS WITH SOLID-STATE BALLASTED HIGH-PRESSURE SODIUM LAMPS

R. R. Verderber and O. Morse Apr. 1981 32 p refs Presented at Ann. Edison Electric Inst. Conf., Philadelphia, 1 May 1981

(Contract W-7405-eng-48)

(DE81-023202; LBL-12595; CONF-810590-1) Avail: NTIS HC A03/MF A01

The performance of three types of solid-state ballasts used to operate high-pressure sodium lamps is discussed. Each type of solid-state ballast has been designed to operate a high pressure sodium (HPS) lamp of a different wattage (150, 200, and 400 watts). The performance of these ballasts compared to standard core-coil ballasts operating the same HPS lamps shows that system efficiency improves as much as 17%. The solid-state ballasted HPS system also demonstrates excellent regulation with respect to input voltage and output power. These new ballasts can dim the HPS lamps and reduce flicker from more than 60% to less than 3%. Refitting street lighting with these new HPS systems provides an attractive return on initial capital investment. DOE

N81-33416# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 4.

SIMULATION OF RADIOACTIVE RAY FIELDS [SIMULERING AV RADIAK-STRAALFAELT]

Goeran Hulten, Melker Nordstrand, and Thomas Ulvsand Aug. 1980 21 p In SWEDISH

(FOA-C-40120-A3) Avail: NTIS HC A02/MF A01

For training purposes, the readings of instruments (radiation intensity meters) were simulated. This can be done in different ways, which are summarized. In the most advanced instruments, the readings vary according to position in a certain geographic area. Other systems are time controlled by radio emitter and receiver. Different radioactive contaminated fields can be simulated by changing a semiconductor memory in the instrument. A modified intensity meter can still be used for measuring radioactive radiation. Author (ESA)

N81-33417# Bosch (Robert) G.m.b.H., Stuttgart (West Germany). Geschaeftsbereich 8.

INVESTIGATION OF NOISE INSENSITIVE ELECTRONIC CIRCUITS FOR AUTOMOTIVE APPLICATIONS WITH PARTICULAR REGARD TO MOS CIRCUITS Final Report

Ingo Gorille Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 153 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-089; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,15

The application of MOS switching circuits of high complexity in essential automobile systems, such as ignition and injection, was investigated. A bipolar circuit technology, current hogging logic (CHL), was compared to MOS technologies for its competitiveness. The functional requirements of digital automotive systems can only be met by technologies allowang large packing densities and medium speeds. The properties of n-MOS and CMOS are promising whereas the electrical power needed by p-MOS circuits is in general prohibitively large. Author (ESA)

N81-33418# Siemens A.G., Munich (West Germany). Forschungslab.

EXTERNAL WAVEGUIDE MODULATOR Final Report

Franz Auracher and Rudolf Keil Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 152 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-090; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,70

Electro-optical phase and intensity modulators were produced and tested. Waveguide modulators and switches for intensity modulation based on the Mach-Zehnder and the directional-coupler principles were made. The fabrication of single-mode Ti-indiffused strip waveguides in Li NbO3 as well as measurements of their near-field intensity distribution and insertion loss are described. The electrical properties of the electrode structure and its influence on the modulator performance were investigated. The theory of phase and intensity modulation is presented. A 3dB modulation bandwidth of about 1.1 GHz is obtained for interference-waveguide modulators based on the Mach-Zehnder principle. Author (ESA)

N81-33419# Valvo G.m.b.H., Hamburg (West Germany). Roehren- und Halbleiterwerke.

METHODS OF FABRICATING INTEGRATED CIRCUITS FOR HIGH VOLTAGES Final Report

Ulrich Winkler Bonn Bundesministerium fuer Forschung ind Technologie Dec. 1980 45 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-t-80-187; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,45

Bipolar integrated circuits with breakdown voltages from 200 to 250 V were produced using three techniques. Aluminum implantation with subsequent diffusion was employed as a fast insulation method. Heavily phosphorous-doped V grooves allowing a low-ohmic collector contact were studied. Polycrystalline silicon doped with oxygen, used as a passivation layer shows excellent results in suppressing parasitic MOS-channels. Author (ESA)

N81-33420# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelement.

MONOLITHIC INTEGRATION OF UHF-MOSFET-STRUCTURES AND BIPOLAR UHF TRANSISTORS Final Report

Wolfgang Mueller Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 80 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-172; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,80

Compatible UHF MOSFET and bipolar monolithic technology for application to FM and television electronic tuners was studied. A UHF MOS tetrode which features very low noise and high transductance, and MOS triodes and UHF bipolar transistors feasible for integration were developed. Both techniques are combined which produces an integrated UHF balanced consisting of two bipolar transistors and one MOS triode using ion implantation techniques. It is demonstrated that dc dynamic, functional measurements take considerable advantage of the BIMOS mixer circuit. Author (ESA)

N81-33421# Colorado Univ. at Boulder. Dept. of Electrical Engineering.

A METHOD OF DETERMINING THE EMISSION AND SUSCEPTIBILITY OF LEVELS OF ELECTRICALLY SMALL OBJECTS USING A TEM CELL

Ippalapalli Sreenivasiah, David C. Chang, and Mark T. Ma (NBS, Boulder, Colo.) Apr. 1981 55 p refs

(PB81-212862; NBS-TN-1040) Avail: NTIS HC A04/MF A01 CSCL 14B

A theory is discussed which proposes that an electrically small radiating source of arbitrary shape may, to a first order, be modeled by an equivalent dipole system consisting of three orthogonal electric dipoles and three orthogonal magnetic dipoles each excited with arbitrary amplitude and phase. A method of accounting for the first-order variation in the transverse electromagnetic modal field distribution is presented. This involves the inclusion of electric quadrupole terms in the modeling of the test object. Using the reciprocity principle, the same method is extended to the determination of susceptibility levels of electrically small test objects. Some experimental results for the susceptibility test, demonstrating the importance of the quadrupole terms, are presented. GRA

N81-33533# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE APPLICATION OF A GRAPHICAL DATA PROCESSING SYSTEM FOR THE DOCUMENTATION OF UNDERGROUND ELECTRICAL SUPPLY LINES [DER EINSATZ EINES GRAPHISCHEN DATENVERARBEITUNGSSYSTEMS ZUM NACHWEIS UNTERIRDISCHER LEITUNGEN IN DER ELEKTRIZITPETSWIRTSCHAFT]

Wolfgang Lutz *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 65-76 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N81-33422*# Missouri Univ. -Rolla. Graduate Center for Cloud Physics Research.

A MOLECULAR MODEL FOR ICE NUCLEATION AND GROWTH Final Technical Report, 15 Dec. 1977 - 30 Jun. 1981

Aug. 1981 53 p refs

(Contract NAS8-31150)

(NASA-CR-161851) Avail: NTIS HC A04/MF A01 CSCL 20D

The semi-empirical quantum mechanical approach and the central field empirical pair potential model are applied to the

development of molecular models for ice nucleation and growth. For individual titles, see N81-33423 through N81-33424.

N81-33423*# Missouri Univ. -Rolla. Graduate Center for Cloud Physics Research.

A MOLECULAR MODEL FOR ICE NUCLEATION AND GROWTH, ATTACHMENT 1 Final Report

Patricia L. M. Plummer *In its* A Mol. Model for Ice Nucleation and Growth Aug. 1981 27 p refs (For primary document see N81-33422 24-34)

Avail: NTIS HC A04/MF A01 CSCL 20D

The quantum mechanical technique is used to study ionic, configurational, and impurity defects in the ice surface. In addition to static calculations of the energetics of the water monomer-ice surface interactions, molecular dynamics studies were initiated. The calculations of the monomer-ice surface interaction, molecular dynamics studies were initiated. The calculations of monomer-ice surface interactions indicate that many adsorption sites exist on the ice surfaces and that the barriers between bonding sites are relatively low. Bonding on the prism face of ice is preferentially above lattice sites. J.D.H.

N81-33424*# Missouri Univ. -Rolla. Graduate Center for Cloud Physics Research.

A MOLECULAR MODEL FOR ICE NUCLEATION AND GROWTH, ATTACHMENT 2 Final Report

Barbara N. Hale *In its* A Mol. Model for Ice Nucleation and Growth Aug. 1981 22 p refs (For primary document see N81-33422 24-34)

Avail: NTIS HC A04/MF A01 CSCL 20D

The central field empirical pair potential model is applied to studying the effects of kinks, ledges, and vacancies on the absorption of water molecules from the vapor. Molecular dynamics simulations indicate that cluster and/or surface modes play a primary role in the absorption process, the flexibility of the hydrogen bond serves to decrease the energy required for structural interconversion, and the rapid distribution of added energy in a hydrogen bonded system lead to aggregate stability which greatly exceeds that predicted by static energy calculations. J.D.H.

N81-33425# Politecnico di Torino (Italy). Ist. di Meccanica Applicata.

QUASI-ONE-DIMENSIONAL NOZZLE FLOWS WITH NONEQUILIBRIUM CONDENSATION

Joseph H. Clarke (Brown Univ.) and Can F. Delale 1981 74 p refs

(Grant NSF ENG-79-04448)

(Rept-128; TN-128) Avail: NTIS HC A04/MF A01

The compressible nozzle flow of a vapor and gas mixture with nonequilibrium homogeneous condensation is considered. An asymptotic method is used with respect to two disparate parameters appearing in the nonequilibrium integral condensation rate equation coupled to the equations of flow and of state. A high activation limit and another limit consideration that signify a large nucleation time followed by a small droplet growth time are employed. Under the limits, the coupled rate equation is so controlled by the function B(x) over its five zones that there appears a one-to-one correspondence between these zones and the five characteristic condensation zones of the nozzle flow itself. The five zones are initial growth of condensate, further growth, onset region, nucleation zone with growth, and droplet growth zone. J.D.H.

N81-33426*# Old Dominion Univ., Norfolk, Va.

ON THE EFFECT OF BOUNDARY LAYER GROWTH ON THE STABILITY OF COMPRESSIBLE FLOWS Final Report

Nabil M. El-Hady Washington NASA Oct. 1981 47 p refs (Grant NsG-1645)

(NASA-CR-3474) Avail: NTIS HC A03/MF A01 CSCL 20D

The method of multiple scales is used to describe a formally correct method based on the nonparallel linear stability theory, that examines the two and three dimensional stability of compressible boundary layer flows. The method is applied to the supersonic flat plate layer at Mach number 4.5. The theoretical growth rates are in good agreement with experimental results. The method is also applied to the infinite-span swept wing transonic boundary layer with suction to evaluate the effect of the nonparallel flow on the development of crossflow disturbances. M.G.

N81-33427# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Lands and Dynamics Branch.

DEVELOPMENT AND APPLICATION OF A SUBSONIC TRIANGULAR VORTEX PANEL Final Report, 1 Sep. 1979 - 31 Aug. 1980

John C. Sparks Feb. 1981 53 p refs

(AF Proj. 6100)

(AD-A103274; ASD-TR-81-5005) Avail: NTIS HC A04/MF A01 CSCL 20/4

Paneling methods are approximate techniques for solving flow problems over wings and bodies. Vortex panels are used to model flow over wings and other lifting surfaces. The author develops a triangular vortex panel having a vorticity distribution that can vary in magnitude and direction. This panel is used to predict the pressure distribution on a rectangular and a swept-back wing in subsonic flow. Lift distributions obtained compare favorably to Anderson's solution and wind tunnel results. Author (GRA)

N81-33428# ARO, Inc., Arnold Air Force Station, Tenn.

THE EFFECT OF PRESSURE PULSATIONS AND VIBRATIONS ON FULLY DEVELOPED PIPE FLOW Final Report, Oct. 1977 - Sep. 1978

Donald O. Barnett AEDC Aug. 1981 64 p refs Sponsored by AF

(AD-A103330; AEDC-TR-80-31) Avail: NTIS HC A04/MF A01 CSCL 20/4

An analysis is presented of the effect of longitudinal pressure pulsations or vibrations on the velocity distribution in laminar or turbulent fully developed pipe flow. Specifically, the Reynolds equations are formulated in a noninertial reference frame so that the influence of pressure pulsations, vibrations, or a combined pressure and vibrational oscillation can be obtained from a single solution. For axisymmetric developed flow of a constant property (incompressible) fluid, the radial and circumferential momentum equations can be solved and the axial momentum equation is linearized so that the velocity field can be obtained as the sum of a steady and a time-dependent component. By obtaining a solution for the case where the pressure (or amplitude of vibration) varies sinusoidally, one obtains the solution for disturbances of arbitrary waveform through a Fourier series expansion of the disturbance. Results are presented that show that the velocity field is dependent upon the mean flow Reynolds number, a vibrational Reynolds number, and the amplitude of the forcing function. In general, the fluid response to differing waveforms is similar to that obtained for simple harmonic oscillations with respect to the various parameters explored. GRA

N81-33429# Naval Research Lab., Washington, D. C.

THE GROWTH OF HOT REDUCED DENSITY CHANNELS IN GASES DUE TO TURBULENCE AND HEAT CONDUCTION Interim Report

Michael Raleigh 24 Aug. 1981 20 p refs

(RR0110941)

(AD-A103265; NRL-MR-4555) Avail: NTIS HC A02/MF A01 CSCL 20/4

Turbulence causes hot, reduced density channels in gases to dissipate rapidly. The scaling of channel radius with time is predicted using the averaged governing equations of fluid motion and the assumption of pseudo-self-similar expansion. Correlation terms in the governing equations are replaced by terms proportional to an eddy diffusivity and including the average fluid properties. The diffusive growth thus predicted is compared to experimental results and to the normal heat conduction limit. GRA

N81-33430# Pennsylvania State Univ., University Park. Applied Research Lab.

A COMPUTER PROGRAM FOR CALCULATING POTENTIAL FLOW SOLUTIONS FOR FLOW THROUGH LINER AND STATIONARY CIRCULAR CASCADES

A. M. Yocum 26 Jun. 1981 137 p refs

(Contract N00024-79-C-6043)

(AD-A103549; ARL/PSU-TM-81-130) Avail: NTIS HC A07/MF A01 CSCL 20/4

The Douglas Neumann Cascade Program has been rewritten so that it can analyze circular cascades with inward or outward radial flow directions, in addition to linear cascades for which it was originally developed. A solution for circular cascades is obtained by employing a conformal transformation which maps the circular cascade into a linear cascade. The capability available in the original program of analyzing multiple cascades has been preserved and can also be applied to circular cascades. In addition, the use of auxiliary storage has been modified and a new procedure for solving the system of equations for large problems has been developed which was found to significantly reduce the computation time. Included in this report is an explanation of the theory and a description of the program and its verification. GRA

N81-33431# York Univ., Downsview (Ontario). Dept. of Physics.
AN EXPERIMENTAL STUDY OF INERTIAL WAVES IN A ROTATING FLUID CYLINDER DURING SPIN-UP OF THE FLUID FROM REST Final Report, 21 Feb. 1977 - 29 May 1981
Keith D. Aldridge 29 Jul. 1981 22 p refs
(Contract DAAG29-80-C-0006; Grants DAAG29-77-G-0105; DAAG29-78-G-0122)
(AD-A103557; ARO-14990.2-E) Avail: NTIS HC A02/MF A01 CSCL 20/4

This research has been primarily concerned with the excitation and detection of inertial waves in a fluid contained in a rotating cylindrical cavity during spin-up of the fluid from rest. Application of this work is to the study of fluid filled projectiles and their stability in free flight. It is well known that a projectile containing fluid will be subject to instability if its nutational frequency is near one of the eigenfrequencies of the contained fluid. Our work has centered on finding these time dependent eigenfrequencies for a fluid which completely fills a cylindrical cavity. Also of interest in the application of our work is the rate at which these waves decay once they are excited during the spin-up period. Included in our experimental work was a study of decay rates for several inertial waves during spin-up from rest.
Author (GRA)

N81-33432# Naval Postgraduate School, Monterey, Calif.
FREE CONVECTION FROM A SEMI-INFINITE VERTICAL PLATE WITH DISCONTINUOUS BLOWING OR SUCTION M.S. Thesis
William Andrew Schiesser Mar. 1981 109 p refs
(AD-A104055) Avail: NTIS HC A06/MF A01 CSCL 20/4

An analytical investigation of laminar free convection from a semi-infinite vertical plate is undertaken with the following special conditions imposed. The plate is maintained at a constant temperature greater than that of the ambient fluid. At an arbitrary distance above the leading edge a constant rate of blowing or suction is initiated extending uniformly along the remainder of the plate. The solution was obtained using the method of matched asymptotic expansions whereby an inner series described the velocity and temperature profiles near the discontinuity in the vicinity of surface and an outer series approximated the behavior at greater distances from the plate. The inner series was also used to determine the heat transfer characteristics at the surface of the plate. The ambient fluid was assumed to be air with a Prandtl number of 0.72.
Author (GRA)

N81-33433# Naval Surface Weapons Center, White Oak, Md.
A COMPUTER PROGRAM FOR MODELING WATER ENTRY CAVITY PERFORMANCE AND COMPARISONS OF PREDICTED WITH OBSERVED CAVITIES Interim Report, Aug. - Oct. 1980
M. A. Metzger 1 Feb. 1981 64 p refs
(AD-A104177; NSWC/TR-81-59) Avail: NTIS HC A04/MF A01 CSCL 20/4

A computer program is presented which is capable of modelling the geometry and performance of the water entry cavity produced by the entry of axially symmetric projectiles. The program is based on an existing theoretical cavity flow model modified to account for atmospheric surface pressure. The computer model is shown to satisfactorily predict cavities produced by vertical and oblique entries (including high-speed entries) from normal air of right circular cylinders and truncated ogives. GRA

N81-33434# Johns-Manville Sales Corp., Denver, Colo.
EFFECT OF TEMPERATURE SET-BACK ON HEAT PUMP PERFORMANCE Final Draft Report, 1 Mar. 1980 - 1 Apr. 1981
S. E. Kurtz 1 Apr. 1981 184 p refs
(Contract DAAK70-78-D-0002)
(AD-A104133; USAFESA-T-2099) Avail: NTIS HC A09/MF A01 CSCL 13/1

This report documents an analysis which shows that energy savings and corresponding cost savings could be realized by employing set-back strategies dependent on location, heat pump capacity and amount of set-back. Author (GRA)

N81-33435# Wisconsin Univ. - Madison. Mathematics Research Center.
STABILITY OF TRANSONIC FLOWS ALONG A NOZZLE Technical Summary Report
Tai-ping Liu Jun. 1981 31 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-78-02202)
(AD-A103847; MRC-TSR-2230) Avail: NTIS HC A03/MF A01 CSCL 20/4

Transonic flows along a nozzle are described based on a one-dimensional model. It is shown that flows along the expanding portion of the nozzle are stable. On the other hand, flows with standing shock waves along a contracting duct are dynamically unstable. This was conjectured by the author based on the study of noninteracting wave patterns. The author had shown earlier that supersonic and subsonic flows along a duct with various cross sections are stable. Basic to our analysis are estimates showing that shock waves tend to decelerate along an expanding duct and accelerate along a contracting duct. GRA

N81-33436# Wisconsin Univ. - Madison. Mathematics Research Center.
WEAKLY NONLINEAR INTERACTIONS AND WAVE-TRAPPING
Yuriko Renardy Jul. 1981 28 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A103856; MRC-TSR-2243) Avail: NTIS HC A03/MF A01 CSCL 12/1

When the flow over a submerged, round, upright cylinder, situated in a large ocean, is forced by a train of plane waves, linear theory (Yamamuro, 1981) shows that the response can be abnormally large for certain forcing frequencies. The aim of this paper is to present a weakly nonlinear theory, where wave interactions, arising from the quadratic terms in the free-surface boundary conditions, can yield abnormally large responses. A specific interaction will be considered between a flow at a subharmonic frequency and a flow at the driving frequency. The reason for considering such an interaction derived from a consideration of some experimental results of Barnard, Pritchard and Provis (1981). Author (GRA)

N81-33437# Los Alamos Scientific Lab., N. Mex.
SHOCK WAVE PHYSICS GROUP (M-6)
C. E. Morris 1981 6 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23-25 Jun. 1981
(Contract W-7405-eng-36)
(DE81-025340; LA-UR-81-1896; CONF-810684-30) Avail: NTIS HC A02/MF A01

Experimental facilities and activities of the shock wave physics group at LASL are described. The facilities include a compressed gas gun, two-stage gas gun, high explosive facilities, and a pulsed megagauss field facility. DOE

N81-33438# South Carolina Energy Research Inst., Columbia.
RESIDUAL-ENERGY-APPLICATIONS PROGRAM: SUPPORT AND INTEGRATION REPORT
F. J. McCrosson Nov. 1980 94 p refs
(Contract DE-AC09-77ET-12866)
(DE81-025479; DOE/ET-12866/6) Avail: NTIS HC A05/MF A01

The proposed government-owned EAST Facility at the Savannah River Plant in Aiken, South Carolina, would provide capabilities for development and confidence testing of industrial heat pumps, high temperature bottoming cycles, low temperature Rankine cycle power generation systems, and absorption

chillers. This report describes support and integration activities that were performed during the contract year. The various elements that impact on the EAST Facility are discussed and an assessment of the EAST Facility mission is given. The report concludes with proposed milestones, schedule, and costs for design, construction, and operation of the facility. DOE

N81-33439# Brown Univ., Providence, R. I. Div. of Engineering.

PHYSICS OF TWO-PHASE FLOW: CHOKED FLOW

P. F. Maeder, R. DiPippo (University of Southeastern Massachusetts), M. Delor (Centre d'Etudes Nucleaires de Grenoble), and D. Dickinson May 1981 47 p refs

(Contract DE-AC02-79ET-27225)

(DE81-025722; DOE/ET-27225/15; GEOFLO/10) Avail: NTIS HC A03/MF A01

It is shown that the basic equations governing the flow of a two phase fluid, i.e., liquid and vapor, are natural extensions of those equations that describe single phase flow. The exact form of the equations depends on the particular assumptions used to characterize the two phase flow, i.e., the equations depend on the model chosen. In general the mathematical model is selected so as to retain as much of the physics of the phenomena as possible while at the same time permitting solutions to be obtained without undue complexity. The following quantities were computed for saturated water substance over the temperature range 100 to 2500 C and for saturated Refrigerant-114 over the range -20 to +700 C: choking velocity, critical or choking flow density, and saturation properties. Tables of the results are given along with graphs of selected functions. DOE

N81-33440# Midwest Research Inst., Golden, Colo. Building Systems Research Branch.

GROUND-COUPLED COOLING IN HOT, ARID REGIONS

Tad L. Bircher Aug. 1981 6 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE81-028357; SERI/TP-722-1355) Avail: NTIS HC A02/MF A01

Based on results from a computer simulation, the impact of ground-coupling on the cooling loads of desert buildings is evaluated. The thermal effects of variation in several parameters were assessed and a ground-coupling design with minimal loads was derived. A detailed comparison of the ground-coupling design with a similar high-mass well-insulated surface building was then made using results of monthly heat balance computations. Results of the parametric studies indicated that the building's annual performance is sensitive to the amount and orientation of fenestration, to the soil depth around the building, and to the amount and location of insulation. The above-grade and ground-coupled cases are compared. DOE

N81-33441# Beet Sugar Development Foundation, Fort Collins, Colo.

EVAPORATION BY MECHANICAL VAPOR COMPRESSION Final Report, Sep. 1979 - 31 Oct. 1980

Clair H. Iverson, Glenn E. Coury, and James H. Fischer 1980 208 p refs

(Contract DE-AC03-79CS-40208)

(DE81-022517; BSDF-38-4Q-80) Avail: NTIS HC A10/MF A01

A review of existing technology and application of the mechanical vapor recompression and falling film evaporation in both the sugar and nonsugar industries, and the potential of application to the domestic beet sugar industry is made. Upon assimilating the information gathered, certain design guidelines were established, possible candidate factories for a demonstration project were identified, and a preliminary technical and economic evaluation of the sites was made. The Nampa, Idaho plant of the Amalgamated Sugar Company was selected as the most amenable from the standpoint of technical compatibility, the most attractive on investment and the enthusiasm of the management. Preliminary engineering was done for the Nampa site, permitting a reasonably definitive installed cost estimate to be made. DOE

N81-33442# California Univ., Berkeley. Lawrence Berkeley Lab. Div. of Physics, Computer Science and Mathematics.

EXTENSION OF GLIMM'S METHOD TO THE PROBLEM OF GAS FLOW IN A DUCT OF VARIABLE CROSS-SECTION Ph.D. Thesis

Simon Kaman Fox Dec. 1980 119 p refs

(Contract W-7405-eng-48)

(DE81-029856; LBL-12322) Avail: NTIS HC A06/MF A01

Various numerical methods for extendng Glimm's scheme to solve a nonlinear hyperbolic system of partial differential equations in one space variable of the form anti u sub t + anti f sub x (anti u) = anti g (anti x,u) are described. The reason for considering Glimm's scheme rather than some finite solution of a given hyperbolic system of partial differential equations without requiring it to be written in conservation form. The numerical scheme with Sod's operator slitting method; and (3) Liu's scheme. In symmetric gas flow is studied, and Sod's operator splitting method is shown to be best among the three numerical schemes. Finally, gas flow in a duct of variable cross-section is discussed together with the classical Chisnell's formula which describes the changes in the speed of the shock with respect to the varying cross-sectional area. It is shown that incorporating Chisnell's formula into Glimm's scheme (with operator splitting) and Liu's scheme can be done easily; moreover, the resulted schemes are best in treating sock propagation problem in a duct of monotonically decreasing and increasing cross-sectional area respectively. Thus, the case of a variable area duct can be handled by hybridizing Glimm's scheme (with operator slitting and Chisnell's formula) and Liu's scheme (with Chisnell's formula).

N81-33443# Science Applications, Inc., La Jolla, Calif.

USER'S MANUAL FOR THE DOEHPE (DOE HEAT PUMP EFFICIENCY) COMPUTER CODE

13 Aug. 1980 18 p refs

(Contract DE-AC03-79CS-10757)

(DE81-021562; SAI-444-80-479-LJ) Avail: NTIS HC A02/MF A01

The computer code used to generate air source heat pump seasonal and annual performance factors is documented. These factors as well as annual energy consumption for each of the six climatic regions in the US are calculated. The standard measurements of heat pump capacities, power inputs and heat pump description data are used as input data. The system description data is used to differentiate between single speed and dual speed compressors, as well as to account for different degradation coefficients, modes of operation (cooling and heating, or heating only), and defrosting systems (demand or time temperature control). For dual speed compressor models, the code differentiates between compressors which cycle on and off at high speed and compressors which alternate between low and high speeds to meet the building heating or cooling loads. DOEHPE also accomodates heat pump systems that do not have an air circulation fan on the indoor coil as part of the system. DOE

N81-33444# California Univ., Livermore. Lawrence Livermore Lab.

PSUEDO-3D, ISODENSITY AND DENSITY PROFILES FROM FIBER OPTIC OUTPUT OF A MACH-130 AIR SHOCK

C. H. Dittmore and H. D. Glenn 5 Jun. 1981 9 p refs Presented at SPIE Intern. Symp., San Diego, 24 Aug. 1981

(Contract W-7405-eng-48)

(DE81-023059; UCRL-85655; CONF-810810-2) Avail: NTIS HC A02/MF A01

A modified Voitenko compressor generated a Mach-130 air shock in an outlet pipe open to the atmosphere. Fiber optics transmitted luminosity associated with propagation of the air shock to an external display board, which was scanned with a high speed streaking camera. The computerized microdensitometer scanning technique for converting the film records to pseudo-3D, isodensity, and density profiles is described. The isodensity contours can be displayed using different colors to facilitate analysis. This technique can achieve resolutions of 1 ns and 2 micrometers. The microdensitometer output was digitized for input to data display programs run on a CDC 7600. These results were used to provide submicrosecond accuracy for shock propagation over a 5 m of the outlet pipes. In addition, information about gas flow behind the shock front was obtained. DOE

N81-33445# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Thermische Kraftanlagen.
DIRECT CONDENSATION BY HUMID AIR Final Report
Stefan Schwab and Bruno Schiebelsberger Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-153; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

The practicability of direct condensation with humid air (DKFL) for waste heat removal from thermal power plants was investigated with regard to technical, economical and environmental aspects. The adjustment of a uniform trickling-water film was examined. A vertical test tube was erected to study the phenomenon of a trickling-water film. A pilot plant with a vertical tube-bundle was installed to evaluate the main process parameters. The applicability of the cooling system is judged. A theoretical model was derived for the design of a DKFL apparatus. A vertical geometry for the test tube has essential operational and economical advantages in comparison with a horizontal one.
Author (ESA)

N81-33446# Essen Univ. (West Germany). Angewandte Thermodynamik und Klimatechnik.
BASIC INVESTIGATIONS ON HEAT PUMPS, VOLUME 2 Final Report
Hans-Georg Dick, Dan Dai Nguyen, Joachim Paul, Johannes Reichelt, Manfred Renz, and Arnold Tolle Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 300 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-80-163-Vol-2; ISSN-0340-7608) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 72,20

Computer programs that determine the basic characteristics of heat pumps for different refrigerants and the interference between refrigerant and oil, and especially reciprocating compressors for heat pumps, are presented. The influence of electric-motor cooling, lubrication, different refrigerants, speed control and partial-load behavior of heat exchangers are emphasized. Mixtures of solvents and refirgerants for absorption heat pumps were studied and additional measurements for heat pump operation were carried out.
Author (ESA)

N81-33447# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
NUMERICAL SOLUTION OF THE NAVIER STOKES EQUATIONS BY MEANS OF A MULTIGRID METHOD AND NEWTON ITERATION
W. J. A. Mol Nov. 1980 14 p refs Submitted for publication
(MC-NW-92/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3

A multigrid method for the solution of elliptic boundary value problems in a rectangle is considered. A seven point restriction and prolongation operator is introduced, with which a Galerkin approximation can be defined as a coarse grid operator. A seven point incomplete LU decomposition is chosen as a smoothing operator. It is shown that the method is fast and robust for a large variety of problems. Particular numerical experiments on the Navier-Stokes equations are reported : the driven cavity and the flow around a cylinder.
Author (ESA)

N81-33324# Stuttgart Univ. (West Germany).
INVESTIGATION OF THE FLOW IN INLET NOZZLES [UNTERSUCHUNG DER STROEMUNG IN EINSTROEMDUESEN]
H. Becker *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 53-74 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33325# Stuttgart Univ. (West Germany).
COMPARISON OF VELOCITY MEASURING METHODS IN A FREE AIR STREAM [VERGLEICH VON GESCHWINDIGKEITSMESSVERFAHRENIN EINEM LUFTFREISTRAHL]
J. Schmaldienst *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 75-101 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33326# Stuttgart Univ. (West Germany).
FLOW MEASUREMENTS IN LOW-PRESSURE STEAM TURBINES WITH CONTINUOUSLY AERATED PROBES [STROEMUNGSMESSUNGEN IN NIEDERDRUCKDAMPFTURBINEN MIT KONTINUIERLICH BELUEFTETEN SONDEN]
A. Heneka *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 103-120 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33330# Stuttgart Univ. (West Germany).
CALCULATION OF FLOW IN TURBOMACHINES [BEITRAG ZUR BERECHNUNG DER STROEMUNG DURCH TURBOMASCHINEN]
M. vonAllmen and J. Messner *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 175-196 refs In GERMAN Sponsored in part by Deutsche Forchungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N81-33448* National Aeronautics and Space Administration. Pasadena Office, Calif.
OPTICAL GYROSCOPE SYSTEM Patent
Willis C. Goss (JPL, California Inst. of Tech., Pasadena) and Raymond Goldstein, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 28 Jul. 1981 13 p Continuation-in-part of US Patent Appl. SN-853349, filed 21 Nov. 1977 Sponsored by NASA
(NASA-Case-NPO-14258-1; US-Patent-4,280,766; US-Patent-Appl-SN-972252; US-Patent-Appl-SN-853349; US-Patent-Class-356-350; US-Patent-Class-350-370; US-Patent-Class-356-351) Avail: US Patent and Trademark Office CSCL 14B

Light beams pass in opposite directions through a single mode fiber optic wave guide that extends in a circle or coil in an optical gyroscope system which measures the rotation rate of the coil by measuring the relative phase shifts of the beams by interferometric techniques. Beam splitting and phase shifting of the light are facilitated by utilizing brief pulses of light and by using light-controlling devices which are operated for a brief time only when the light pulse passes in one direction through the device but not at a different time when the pulse is passing in the opposite direction through the device. High accuracy in rotation measurement is achieved at both very slow and very fast rotation rates, by alternately operating the system so that at zero rotation the interfering waves are alternately 90 out of phase and in phase. Linear polarization of the light beams is maintained by coiling the full length of the optic fiber in a single plane.
Official Gazette of the U.S. Patent and Trademark Office

N81-33449*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR PRECISION CONTROL OF RADIOMETER Patent Application csc 14b
Roger S. Estey, inventor (to NASA) (JPL) Filed 30 Apr. 1981 14 p
(Contract NAS7-100)
(NASA-Case-NPO-15398-1; US-Patent-Appl-SN-259212) Avail: NTIS HC A02/MF A01

A radiometer controller of a solar radiation detector is described. The system includes a calibration method and apparatus comprised of mounting all temperature sensitive elements of the controller in thermostatically controlled ovens during calibration and measurements, using a selected temperature that is above any which might be reached in the field. The instrument is calibrated in situ by adjusting heater power to the receptor cavity in the radiometer detector to a predetermined full scale level as displayed by a meter. Then with the heater de-energized and the receptor cavity covered, the voltage output, is set to zero as displayed by the meter. Next the preset power is applied to the heater and the output of the radiant measurement channel is applied to the panel meter. With this preset heater power producing the proper heat, the gain of the measurement channel is adjusted to bring the meter display to full scale. NASA

N81-33450*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.

DYNAMIC PROFILE OF A PROTOTYPE PIVOTED PROOF-MASS ACTUATOR

David W. Miller Aug. 1981 29 p refs
(Grant NAG1-126)
(NASA-CR-164861; SSL-29-81) Avail: NTIS HC A03/MF A01 CSCL 14B

A prototype of a linear inertial reaction actuation (damper) device employing a flexure-pivoted reaction (proof) mass is discussed. The mass is driven by an electromechanic motor using a dc electromagnetic field and an ac electromagnetic drive. During the damping process, the actuator dissipates structural kinetic energy as heat through electromagnetic damping. A model of the inertial, stiffness and damping properties is presented along with the characteristic differential equations describing the coupled response of the actuator and structure. The equations, employing the dynamic coefficients, are oriented in the form of a feedback control network in which distributed sensors are used to dictate actuator response leading to a specified amount of structural excitation or damping. A.R.H.

N81-33451*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.

A DEMONSTRATION OF THE USE OF GENERALIZED PARITY RELATIONS FOR DETECTION AND IDENTIFICATION OF INSTRUMENT FAILURES OF A FREE-FREE BEAM

Carolyn S. Major Sep. 1981 81 p refs
(Grant NAG1-126)
(NASA-CR-164873; SSL-28-81) Avail: NTIS HC A05/MF A01 CSCL 14B

A means of detecting failures in sensors and actuators on board large, flexible space structures is described. A failure detection and indentification (FDI) method which does not require triplication of position, attitude, and shape data is that of generalized parity relations. Parity relations are derived and an FDI routine is implemented on a computer-simulated flexible beam modeled on an experimental beam at NASA Langley Research Center. The effectiveness of the FDI procedure is relatively insensitive to disturbances and noise, but is very sensitive to modeling errors, including frequency errors, mode shape errors, and sensing and actuation spillover. J.D.H.

N81-33452*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

APPLICATION OF INFORMATION THEORY TO THE DESIGN OF LINE-SCAN IMAGING SYSTEMS

Friedrich O. Huck, Stephen K. Park, Nesim Halyo, and Steven Stallman Sep. 1981 40 p refs Prepared in cooperation with Information and Control Systems, Hampton, Va.
(NASA-TP-1897; L-14542) Avail: NTIS HC A03/MF A01 CSCL 14B

Information theory is used to formulate a single figure of merit for assessing the performance of line scan imaging systems as a function of their spatial response (point spread function or modulation transfer function), sensitivity, sampling and quantization intervals, and the statistical properties of a random radiance field. Computational results for the information density and efficiency (i.e., the ratio of information density to data density) are intuitively satisfying and compare well with experimental and theoretical results obtained by earlier investigators concerned with the performance of TV systems. Author

N81-33453# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.

EFFECTS OF WAVELENGTH CHANGE IN HOLOGRAPHIC RECONSTRUCTIONS Final Report, Oct. 1978 - Sep. 1979

R. W. Menzel AEDC Aug. 1981 34 p refs
(AD-A103205; AEDC-TR-79-84) Avail: NTIS HC A03/MF A01 CSCL 14/5

Holographic imaging is necessary in some particulate measurements in test facilities at AEDC. Additionally, projection of holographic images of infrared (IR) test objects is being considered to enhance the IR sensor test capability at AEDC. Lasers of different wavelengths often are necessary in the recording and reconstruction of the required holograms. As a result, a study of the effects of a wavelength change between the recording and reconstruction illumination on the aberration, resolution, and location of holographically reconstructed images was experimentally undertaken. Control of aberration and resolution degradation, to the extent possible, is described. Author (GRA)

N81-33454# ARO, Inc., Arnold Air Force Station, Tenn.

A COMPARISON OF PARTICLE DIAGNOSTIC SYSTEMS Final Report, Oct. 1977 - Sep. 1979

Jay D. Hunt Aug. 1981 86 p refs
(AD-A104027; AEDC-TR-80-33) Avail: NTIS HC A05/MF A01 CSCL 14/2

An experimental investigation was conducted to examine the particle sizing characteristics of four particle diagnostic systems (PDS): a fiber-optics array probe (FOS), two separate particle-sizing interferometers (PSI), and a backscattering particle-sizing system (BPS). Simulated icing clouds, produced in an icing research test cell, were used as the particle flow field for the investigation. An in-line holocamera was selected as the baseline device and was, therefore, used to calibrate each icing cloud. Each PDS was used to obtain particle size information for each simulated icing cloud. Typical examples of the results obtained with each PDS are presented as well as typical calibration results. The results obtained with each PDS are also compared to the calibration results. The comparisons show that the FOS is the only device tested that yields results comparable to the holocamera results. The particle number density of a simulated icing cloud is shown to be too large for obtaining accurate particle size data with an on-axis forward-scattering PSI. The data obtained with the BPS exhibit a monodisperse distribution and are inconsistent with the holographically obtained calibration data. Author (GRA)

N81-33455# Washington Univ., Seattle. Applied Physics Lab.

ACOUSTIC AND THERMAL-SENSOR SYSTEMS FOR THE IN-SITU HEAT-TRANSFER EXPERIMENT

L. O. Olson Jul. 1981 143 p refs Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE81-028187; SAND-81-7061) Avail: NTIS HC A07/MF A01

The in-situ heat transfer experiment (ISHTE) in the clay sediments of the deep ocean is part of a program to evaluate the feasibility of storing high-level nuclear waste in the subseabed sediments of the deep ocean. The equipment developed in support of the ISHTE planned for the ocean north of Hawaii is described with emphasis on the acoustic tracking and telemetry system, the 15 thermal sensor probes for implanting into the sediments, in-situ data recording equipment, calibration of the probes, and a line source probe. DOE

N81-33456# California Univ., Livermore. Lawrence Livermore Lab.

CALIBRATION OF PIEZORESISTIVE GAUGES

G. L. Nutt and J. O. Hallquist 15 Jun. 1981 5 p refs Presented at APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract W-7405-eng-48)
(DE81-024193; UCRL-86285; CONF-810684-18) Avail: NTIS HC A02/MF A01

The dynamic response of two ytterbium gauges is modeled

using the two dimensional Lagrangian finite difference code on DYNA2D. The gauges are embedded in a medium of polymethylmethacrylate. The stress and strain state of each element of the gauge is then used to calculate the resistance change as a function of time. The ratio of the calculated transverse to normal signals is 0.58, in excellent agreement with measurements. DOE

N81-33457# California Univ., Berkeley. Lawrence Berkeley Lab.

STATUS AND PROBLEMS OF SEMICONDUCTOR DETECTORS

J. T. Walton, F. S. Goulding, E. E. Haller, and R. H. Pehl Mar. 1981 32 p refs Presented at INS Meeting on Nucl. Radiation Detectors, Tokyo, 23 Mar. 1981

(Contract W-7405-eng-48)

(LBL-12380; CONF-810351-2) Avail: NTIS HC A03/MF A01

The types of silicon and germanium detectors used or presently being developed for nuclear experiments are reviewed. Large-area silicon and germanium detector telescopes for use in long-range particle detection and identification are emphasized. Large area position-sensitive detectors are also described. Some results are presented regarding radiation damage and damage repair by annealing. Evidence is also presented for the importance of producing large area silicon crystals of adequate quality to reduce trapping problems to negligible proportions. DOE

N81-33458# Sandia Labs., Albuquerque, N. Mex.

DESIGN AND USE OF DENSITY GAUGES FOR FOSSIL-ENERGY PROCESSES

D. G. Sample, M. G. Thomas, and J. K. Linn Jun. 1981 24 p refs Presented at the Symp. on Instrumentation and Control for Fossil Energy Processes, San Francisco, 8 Jun. 1981

(Contract DE-AC04-76DP-00789)

(DE81-023306; SAND-81-1347C; CONF-810607-6) Avail: NTIS HC A02/MF A01

A density gauge has been designed to function as a catalyst level detector in the H-Coal 1 inch bench reactor. The system utilizes a Cs137 source and a BiGe scintillator as a detector. The source/detector systems are encompassed in a yoke which can be maneuvered over approximately 1/3 of the reactor height. Both catalyst level and bed uniformity can be measured. The system, as tested, can distinguish coal slurry and roughly 5% catalyst by volume. DOE

N81-33459# Sandia Labs., Albuquerque, N. Mex.

ANALYSIS OF THERMAL CONDUCTIVITY PROBES FOR HIGH TEMPERATURE APPLICATIONS

J. A. Koski Apr. 1981 52 p refs

(Contract DE-AC04-76DP-00789)

(DE81-025007; SAND-81-0106) Avail: NTIS HC A04/MF A01

Various analyses performed to confirm the viability and potential accuracy of a thermal conductivity probe apparatus are summarized and conclusions are presented. The apparatus under consideration was designed for measurements of conductivity of UO2 powders in inert atmospheres at elevated temperatures to 2300 K in support of the post accident heat removal (PAHR) program. Both analytical solutions and numerical computer models are used for study of the apparatus design. The effects of probe thermal mass and limited sample size on measurement accuracy are analyzed and discussed. Results indicate that the design considered have the potential for accuracies within 5 percent in the conductivity range of interest (0.1 to 3 W/m-K). DOE

N81-33460# Siemens A.G., Munich (West Germany). Forschungslab.

GAS SENSITIVE SEMICONDUCTOR FIELD EFFECT SENSORS Final Report

Manfred Plihal, Hans Pink, Ludwig Treitinger, and Peter Tischer Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 90 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-091; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,90

Modified field effect transistors (FET) and MIS diodes as well as semiconducting metal oxides were tested on their suitability for detecting the gases CO, SO2, NO, N2O, and NH3. In FET structures of silicon the conductivity of a channel is field controlled by the adsorption of gases and volatiles at the surface of a sensitive layer of an organic material, palladium, or zeolite. The conductivity of the semiconducting metal oxides is changed by gas adsorption at the surface. MIS diodes with palladium layers allow the selective detection of hydrogen. With detectors based semiconducting metal oxides, oxidizable gases in air can be detected. Author (ESA)

N81-33461# Philips G.m.b.H., Bremen (West Germany). Electro Spezial Unternehmensbereich.

DEVELOPMENT OF A COMPACT MICROWAVE SPECTROMETER FOR GAS ANALYSIS, BASED ON THE START EFFECT Final Report

Gerhard Meier-Kirchner and Manfred Rexin Bonn Bundesministerium fuer Forsching und Technologie Dec. 1980 40 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forshung und Technologie

(BMFT-FB-T-80-190; ISSN-0340-7608; Rept-08101) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,40

A spectrometer suitable for in process and pollution control was developed. The main components (digital tunable high frequency source, stark cell, stark electrode, vacuum system, analog and digital electronics) are described. The limits in determining the gas concentration were estimated and sources of interference were examined. Possible improvements are outlined, such as the suppression of the memory effect (residual gases in the measuring cell) which is required in order to broaden the area of application of this spectrometer. Author (ESA)

N81-33462# Fraunhofer Inst., Freiburg (West Germany). Inst. fuer Physikalische Weltraumforschung.

EUV-IR TELESCOPE STUDY Final Report

Gerhard Schmidtke, Peter Henneberg (Zeiss (Carl)), Karl-Heinz Hager (Zeiss, (Carl)), Franz Busch (Zeiss, (Carl)), and Dieter Reinhardt (Zeiss,(Carl)) Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 121 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-005; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,40

The optical properties of a telescope providing fields of vision from seconds of arc to degrees were studied. The radiation passes the telescope nearly parallel and enters a spectrometer for dispersion. The optical properties of different telescope spectrometer combinations were geometrically analyzed by a ray tracing method. The range of available spectrometers is so wide that for a variety of applications spectroscopic measurements can be carried out with modest or higher spectral and spatial resolutions, and that from the soft X-ray through the near infrared spectral regions. Author (ESA)

N81-33463# Fraunhofer Inst., Freiburg (West Germany). Inst. Fuer Physikalishe Messtechnik.

THE EUV SPECTROMETER IN THE AEROS PROGRAM Final Report

Gerhard Schmidtke and Manfred Knothe Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 89 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-010; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

Solar photon flux at 106 to 16 NM during the declining solar cycle 20 was observed. From these measurements, EUV indices were derived, representing the EUV fluxes in absolute numbers. In addition, atomic oxygen temperatures and densities were derived from attenuation measurements of specific solar emissions, by means of EUV absorption analysis. The combination of these data sets is a powerful tool for observing the upper atmosphere response to variations of the solar EUV flux, e.g., the oxygen density and temperature. The same experiment allowed the study of other subjects, such as the South Atlantic Anomaly, multiplies degradation, satellite mutation, etc. Author (ESA)

N81-33464# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Haupabt. fuer Vorprojekte und Studien (PRV).
DESIGN STUDY ATLAS-B: METRIC CAMERA ON THE SPACELAB PALLET Final Report
Heinz Stolze Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 194 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-020; ISSN-0170-1339) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

A metric camera system which can be flown on the spacelab pallet is described. The system is based on the metric camera system which was flown with the first spacelab payload in the Spacelab module. The use of a larger film cartridge, modifications of the control electronics and the development of a container equipped with a window in which the camera can operate, and necessary housekeeping subsystems are suggested. The implementation of an image motion compensation mechanism to improve ground resolution is studied.

N81-33465# Zeiss (Carl), Oberkochen (West Germany).
OPTIMIZATION AND AUTOMATION OF THE APPLICATION-ORIENTED FUNCTIONS OF ELECTRON MICROSCOPES Final Report
William Egle Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 55 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-167; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,60

Design improvements in medium performance of electron microscopes are reported. The electro/mechanical optical properties of the microscope column were improved; a maximum resolution of 0.344 nm is obtained in routine operation and the magnification extends from 150 to 400,000. The carbon free ion getter pump system and the pump version without high vacuum pump offer conditions for safe, continuous documentation when the newly developed outside the vacuum photographic system is used. Author (ESA)

N81-33466# Heimann G.m.b.H., Wiesbaden (West Germany).
SENSOR FOR RADIOMETRIC MEASUREMENTS WITH PYROELECTRIC DETECTOR AND REFLECTING OBJECTIVE OF LONG FOCAL LENGTH Final Report
Ulrich Mester, Walter Glockmann, and Erich Pudelko Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 127 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-191; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,80

A sensor which permits radiometric and pyrometric measurements is described. The sensor is equipped with a cassegrain reflecting objective of long focal length. Radiation measurements are made in a chopped radiation mode at chopping frequencies between 6 and 40 Hz. The spectral response is selected by different infrared filters. A pyroelectric detector with a small effective sensitive area yields a temperature resolution of better than 0.1 K for target temperatures of 300K. Target identification is accomplished through a parralax-free optical view finder or by a pilot light. Electronic circuits provide computer aided digital or analog signal processing. Author (ESA)

N81-33467# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
AMPLITUDE CALIBRATOR FOR OSCILLOSCOPES
James R. Andrews and Eugene E. Baldwin Apr. 1981 32 p
(PB81-211286; NBSIR-81-1646) Avail: NTIS HC A03/MF A01 CSCL 14B

The amplitude calibrator is designed to provide known dc voltage levels or 1 kHz square waves from plus or minus 1 mV to plus or minus 5 V. It features selectable output impedances of less than 0.1 ohms, 50 ohms, and 1 M ohms. The instrument is designed with sufficient current capability to deliver its indicated voltage into a 50 ohms termination. To protect delicate sampling oscilloscopes, a limiter circuit can also be activated to limit the output voltage to plus or minus 1.8 V. GRA

N81-33322# Stuttgart Univ. (West Germany).
STAGES OF DEVELOPMENT. A CENTURY OF MEASURING TECHNIQUES IN A TESTING LABORATORY [STADIEN EINER ENTWICKLUNG - EIN JAHRHUNDERT MESSTECHNIK AM MASCHINENLABORATORIUM]
M. Busch *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 9-34 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33341# Technische Hogeschool, Delft (Netherlands). Microwave Lab.
SCATTEROMETER SYSTEMS
L. Krul *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 19-27 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N81-33468# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelnink 3.
LASER RADAR EQUATION [LASERRADEREKVATION]
Erik Daniels Apr. 1980 17 p refs In SWEDISH
(FOA-C-30188-E4) Avail: NTIS HC A02/MF A01

Based on the coherent detection of laser echoes from targets at variable distances, expressions are computed for the signal to noise ratio. Numerical examples for a CO2 laser are presented. Author (ESA)

N81-33469# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF XeCl EMISSION IN A HOLLOW CATHODE DISCHARGE M.S. Thesis
George A. Vogel Jun. 1981 64 p refs
(AD-A103348; AFIT/GEP/PH/81-6) Avail: NTIS HC A04/MF A01 CSCL 20/5

This work investigates the characteristics of a hollow cathode discharge containing neon, xenon, and hydrogen chloride gases. The line intensity of the XeCl excimer spontaneous emission (308 nm) is measured as a function of excitation current and the partial pressures of Xe and HCl. The hollow cathode, operating with constant discharge current, produces relatively intense XeCl emission and provides a stable discharge, in spite of the presence of the electronegative Cl ions. Measurements were made for total pressures of 4, 2, and 1 torr, 0, 2, 4, and 8 percent HCl, and mixes of Ne/Xe from 100% Ne to 100% Xe. The hollow cathode provides a unique discharge characteristic by providing both 200 - 400 ev beam like electrons and high densities 10 to the 12th power/cucm of low energy (700 K) electrons. A simple model is developed for the hollow cathode discharge by assuming the electrons are only in these two energy groups. This model is coupled with the dominant chemical processes and is used to explain the behavior of the discharge with direct current excitation. The results of both analysis and measurements show the XeCl emission to be proportional to Xe concentration, HCl concentration, and discharge current. These results indicate that the primary formation process of the XeCl excimer in the hollow cathode is due to the combination of Xe and Cl ions. Author (GRA)

N81-33470# Naval Surface Weapons Center, White Oak, Md. Dept. of Research and Technology.
FREE ELECTRON LASER INSTABILITY FOR A RELATIVISTIC SOLID ELECTRON BEAM IN A HELICAL WIGGLER FIELD Final Report
Han S. Uhm and Ronald C. Davidson Jan. 1981 45 p refs Sponsored in part by Science Applications, Inc.
(ARPA Order 3718)
(AD-A103523; NSWC/TR-81-145) Avail: NTIS HC A03/MF A01 CSCL 20/5

The free electron laser instability for a solid relativistic electron beam propagating in combined transverse helical wiggler and uniform axial guide fields is investigated within the framework of the linearized Vlasov-Maxwell equations. Stability properties are investigated for the choice of equalibrium distribution function in which all electrons have the same value of the linear combination of transverse and helical invariants. The instability growth rate is calculated including a determination of the optimum value of the ratio of beam radius to conducting wall radius for maximum growth. It is found that the maximum growth rate for a solid electron beam is comparable to that for a hollow beam with similar parameters. Moreover, the introduction of a small axial momentum spread significantly reduces the instability growth rate. GRA

N81-33471# University of Southern California, Los Angeles. Center for Laser Studies.
DEVELOPMENT OF COMPONENTS FOR THE HIGH BRIGHTNESS LASER Final Report, May 1977 - Jun. 1980
Elsa Garmire 1 Oct. 1980 85 p refs
(Contract N61339-77-C-0063)
(AD-A103652; CLS-2680) Avail: NTIS HC A05/MF A01 CSCL 20/5

In 1979 DBR lasers were fabricated and their properties studied. Further investigations were undertaken of the beam expander, to determine its potential for the high brightness laser. From this data it was determined that a design change for the high brightness laser is required. This design change is described. In addition, measurements were made on laser amplification to compare this method of achieving higher power compared to the coupled diode arrays. Finally, as a spin-off of this research, a new design for a single mode laser was discovered, using the active/passive laser, a configuration which was fabricated as a first step toward fabrication of DBR lasers. Each of these research efforts are described in this report. Monolithic integration of the necessary components on one substrate for the high brightness laser has been hindered by problems in material and fabrication uniformity. This will be described, and projections for future development will be outlined. Author (GRA)

N81-33472# Yale Univ., New Haven, Conn.
ELECTRON IMPACT CROSS SECTIONS APPLICABLE TO MOLECULAR LASERS Summary Report, 10 Nov. 1979 - 17 Aug. 1981
Shek-Fu Wong 17 Aug. 1981 12 p refs
(Contract N00014-76-C-0078; NR Proj. 394-003)
(AD-A103218) Avail: NTIS HC A02/MF A01 CSCL 20/5

In the program on excited molecules we have completed the experiments on dissociative attachment from vibrationally excited HCl and HF. In this work we observed an unusually large cross section (10 to the -14th power sq cm.) for Cl-/HCl (v=2) and proposed a new mechanism for dissociative attachment by electron impact. These results have been published in Journal of Chemical Physics, 1981. In the program on electronic excitation of noble-gas atoms we have established the experimental methods for studies up to the threshold region. The first results have been obtained for the n=2 states of He, within 4 eV of threshold. In the 2 3S and 2 3P cross sections we observed anomalous angular dependences attributable to a new 2P resonance. GRA

N81-33473# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELECTROOPTICAL DEVICES Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1980
Charles E. Hurwitz 30 Sep. 1980 33 p refs
(Contract F19628-80-C-0002; AF Proj. 2306; AF Proj. 4600)
(AD-A103542; ESD-TR-81-76; ESP-TR-81-76) Avail: NTIS HC A03/MF A01 CSCL 20/5

Contents: Gain Spectra in GaInAsP/InP Proton-Bombarded Stripe-Geometry DH Lasers; The Recycling of Spontaneous Photons in GaInAsP/InP Double-Heterostructure Lasers; Low Dark-Current, High Gain GaInAsP/InP Avalanche Photodetectors; Thickness of LPE Ga(x)In(1-x)As(y)P(1-y) Layers Nearly Lattice-Matched to (100)-InP Substrates; and LPE Surface Morphology of InP(Zn). GRA

N81-33474# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
SOURCE FLOW EFFECT ON LINESHAPE
Harold Mirels 10 Jul. 1981 19 p
(Contracts F04701-80-C-0081; DARPA Order 3646)
(AD-A103835; TR-0081(6764)-1; SD-TR-81-17) Avail: NTIS HC A02/MF A01 CSCL 20/5

The effect of particle motion on spectral lineshape (i.e., Doppler broadening) is usually evaluated by assuming that the particles have a random thermal motion. In high-speed gas-flow lasers, of which chemical lasers are an example, the working fluid may have significant mean velocities as well as random velocities in the optical path direction. In these cases, it is necessary to take the mean motion into account when evaluating the spectral lineshape. The effect of a source flow on Doppler-broadened lineshape is evaluated herein for the case where radiation is perpendicular to the source flow axis. The application to a CW chemical laser is then noted. Author (GRA)

N81-33475# Westinghouse Research and Development Center, Pittsburgh, Pa.
MERCURY BROMIDE LASER RESEARCH Final Report, 1 Jul. 1980 - 31 Mar. 1981
J. L. Pack, C. S. Liu, D. W. Feldman, and I. Liberman 4 May 1981 61 p refs
(Contract N00014-80-C-0604)
(AD-A103730) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report summarizes major effort to build a discharge tube and associated apparatus capable of withstanding temperatures to 300 C and pressure to 150 psia, and to parameterize the HgBr laser fluorescence and laser output with respect to nitrogen and Ne buffer gas densities. Prior parameterization has been limited to buffer gas densities of about 1.3 Amagat since the laser tube was made Pyrex and therefore could not sustain more than about 15 psi internal over pressure. By enclosing the Pyrex laser tube inside a stainless steel pressure vessel, we have overcome this pressure limitation by maintaining a positive external pressure upon the laser tube. The steel tank was pressurized with nitrogen to avoid oxidation of the tube connections. Thus, the discharge tube, by being enclosed in a nitrogen protective atmosphere, withstands both the high temperature operation and the high internal operating pressures. Fluorescence, laser output, voltage and current waveforms were taken at various nitrogen fill pressures up to 300 Torr with Ne buffer gas densities up to 5 Amagat. For our experimental tube, the HgBr laser output and fluorescence efficiency was maximum at a nitrogen fill pressure of 150 Torr and increased with neon buffer gas density up to the maximum tested of 5 Amagat at a reservoir temperature of about 150 C. Author (GRA)

N81-33476# California Univ., Livermore. Lawrence Livermore Lab.
CONTRASTS IN ONE- AND TWO-DIMENSIONAL HYDROCODE CALCULATION OF LASER-GENERATED SHOCK-WAVES IN DISK TARGETS
R. J. Harrach, Y. T. Lee, R. J. Trainor, N. C. Holmes, M. D. Rosen, D. L. Banner, and R. J. Olness 22 Jun. 1981 9 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23-25 Jun. 1981
(Contract W-7405-eng-48)
(DE81-026026; CONF-810684-40; UCRL-86301) Avail: NTIS HC A02/MF A01

A model accounting for trends in calculations and regimes of laser intensity and pulse duration where two dimensional effects become significant is described. The one dimensional and two dimensional hydrocode calculations and results on laser driven planar shock waves in disk targets are compared. It is concluded that the model provides physical insight and semiquantitative information on the onset of two dimensional effects in laser shock wave experiments and allows estimation when one dimensional calculations suffice. DOE

N81-33477# Sandia Labs., Albuquerque, N. Mex.
LASER RESEARCH AND APPLICATIONS Semiannual Report, Oct. 1980 - Mar. 1981
Jun. 1981 44 p refs
(Contract DE-AC04-76DP-00789)
(DE81-026456; SAND-81-0958) Avail: NTIS HC A03/MF A01

Research progress on the following topics is outlined: (1) rare gas halogen laser program; (2) laser triggered switches; (3) laser

controlled ionization front accelerator; (4) lasers for combustion research; (5) 10-(SIGMA) m interferometer for electron density measurements; (6) Q-switched and free running stable pulse 1.06 (SIGMA) m laser; (7) Raman spectroscopy; (8) multiphoton ionization; (9) chemical vapor deposition and plasma etching; (10) laser desorption mass spectrometry; (11) collision broadening and shift of the K 4p-ns and 4p-nd lines by Ar; (12) chemically pumped iodine laser; (13) laser induced chemical reactions; (14) photolytic pumping of a laser by a moving, hot plasma; (15) laser based surface spectroscopy; (16) laser generated low density channels; (17) radiation driven density waves in optically pumped gas lasers; (18) propagation of an annular laser beam; (19) theoretical modeling of the chemical vapor deposition process; (20) charge exchange cross sections for C(6)-H collisions; (21) the stopping power of gold ions for protons; (22) electron ionization cross sections of low-Z ions; (23) electron shielding effects on fusion cross sections; and (24) radiation efficiencies from imploding liners. DOE

N81-33478# Argonne National Lab., Ill.
PULSED LASER MIXING OF NI-AU SURFACE FILMS ON NICKEL SUBSTRATES
P. P. Pronko, H. Wiedersich, K. Seshan, A. L. Helling, T. A. Lograsso, and P. M. Baldo 1980 10 p refs Presented at the Symp. on Laser and Electron-Beam Solid Interactions and Mater. Processing Mater. Res. Soc. Conf., Boston, Nov. 1980
(Contract W-31-109-eng-38)
(DE81-023823; CONF-801124-50) Avail: NTIS HC A02/MF A01

The melt phase alloying of Ni-Au films on Ni substrates were studied for rapid quenches following 35 nanosecond Q switched ruby laser pulses (0.69 micron wavelength) in the energy regime of 0.5 to 3.0 j/cu cm. The Ni and Au films were each 200 A in thickness having been deposited on a polished Ni substrate by standard hot ribbon vapor deposition methods. Data were obtained on pre and post alloyed surface layers using Rutherford backscattering transmission electron microscopy, and STEM energy dispersive X-ray analysis. The melting an resolidification dynamics of the liquid-solid interface was monitored through finite difference intergration of the nonlinear heat conduction equation to give temperature profiles, depth of melting and melt front velocities associated with the liquid-solid phase change. Resolidification velocities were typically 20 meters/second with melt depths extending to a few thousand angstroms depending on pulse energy. DOE

N81-33479# California Univ., Livermore. Lawrence Livermore Lab.
THEORETICAL INVESTIGATION OF A 10 MICRONS FREE-ELECTRON LASER AMPLIFIER USING A 50-MEV MULTI-KA ELECTRON BEAM
V. K. Neil and D. Prosnitz 24 Jun. 1981 8 p refs Presented at the 4th Intern. Topical Conf. on High Power Electron and Ion Beam Res. and Technol., Palaiseau, France, 29 Jun. - 3 Jul. 1981
(Contract W-7405-eng-48)
(DE81-769736; UCRL-85653; CONF-810620-4) Avail: NTIS HC A02/MF A01

Theoretical calculations describing the application of an electron beam of 50 MeV energy and several kA current to a free electron laser (FEL) experiment at 10.6 micrometer signal wavelength. The device is a single pass, high gain amplifier utilizing a planar wiggler with field strength B sub w decreasing with distance down the device. The critical role of beam emittance in determining the required input laser energy and gain of the amplifier is discussed. DOE

N81-33480# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
DATA PROCESSING PROGRAM FOR CALCULATING LASER SAFETY [DATORPROGRAM FOER LASERSAEKERHETSBERAEKNINGAR]
Per Strandberg and Ove Steinvall Jan. 1980 59 p refs In SWEDISH
(FOA-C-30184-E) Avail: NTIS HC A04/MF A01

A computer program which calculates both maximum safe power and safety range when using a laser is presented. The health limits are based on the American National Standard for the safe use of lasers (1976; American National Standards Institute). A complete listing of the program is provided.
Author (ESA)

N81-33481# Technische Universitaet, Munich (West Germany). Sektion Physik.
CONSTRUCTION AND DEVELOPMENT OF TUNABLE HIGH PRESSURE GAS LASERS FOR PHOTOCHEMICAL APPLICATIONS Final Report
Matthias Rateike, Linus Werner, and Bernd Wunderer Bonn Bundesministerium fuer Forshung und Technologie Nov. 1980 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-107; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

A high pressure gas laser system excited by a relativistic electron beam of high current density was developed. The device was tested with xenon, where an excimer transition results in laser emission at a wavelength of 172 mm. Laser pulses with powers ranging up to 10 MW are achieved. The system is suitable for use with other noble gas excimers (Ar, Kr) and can also be used with gas mixtures, e.g., argon/nitrogen, krypton/fluorine, xenon/fluorine. The high quantum energy of the laser photons leads to a wide field of applications in photochemistry. At present, the laser is used in a photofragment spectrometer. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N81-33482* National Aeronautics and Space Administration. Pasadena Office, Calif.
HEAD FOR HIGH SPEED SPINNER HAVING A VACUUM CHUCK Patent
Frank Lombardi, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 28 Jul. 1981 5 p Filed 27 Jun. 1980 Supersedes N80-26661 (18 - 17, p 2274) Sponsored by NASA
(NASA-Case-NPO-15227-1; US-Patent-4,280,689;
US-Patent-Appl-SN-163840; US-Patent-Class-269-21;
US-Patent-Class-118-50; US-Patent-Class-118-52;
US-Patent-Class-427-240) Avail: US Patent and Trademark Office CSCL 13I

The head for a high-speed spinner is characterized by a substantially cylindrical body adapted to be mounted at the distal end of a vertically oriented drive shaft. A vacuum chuck with an upwardly facing chamber is circumscribed by an annular surface for receiving in supported relation a silicon chip. An ordered array of low-pressure cavities is defined about the periphery of the body and connected in communication with the chamber via radially extended bores in order to translate low pressures to the chamber as the head is angularly displaced. A pressure differential is thereby established across the chip for securing it to the head.
Official Gazette of the U.S. Patent and Trademark Office

N81-33483* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ELECTRICAL SERVO ACTUATOR BRACKET Patent
Ralph V. Sawyer, inventor (to NASA) Issued 16 Jun. 1981 4 p Filed 28 Mar. 1980 Supersedes N80-21327 (18 - 12, p 1521)
(NASA-Case-FRC-11044-1; US-Patent-4,274,038;
US-Patent-Appl-SN-135056; US-Patent-Class-318-663;
US-Patent-Class-74-89; US-Patent-Class-92-130R) Avail: US Patent and Trademark Office CSCL 13I

An electrical servo actuator is mounted on a support arm which is allowed to pivot on a bolt through a fixed mounting bracket. The actuator is pivotally connected to the end of the support arm by a bolt which has an extension allowed to pass through a slot in the fixed mounting bracket. An actuator rod extends from the servo actuator to a crank arm which turns a control shaft. A short linear thrust of the rod pivots the crank arm through about 90 for full-on control with the rod contracted

into the servo actuator, and full-off control when the rod is extended from the actuator. A spring moves the servo actuator and actuator rod toward the control crank arm once the actuator rod is fully extended in the full-off position. This assures the turning of the control shaft to a full-off position. A stop bolt and slot are provided to limit pivot motion. Once fully extended, the spring pivots the motion.

Official Gazette of the U.S. Patent and Trademark Office

N81-33484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CONTINUOUSLY VARIABLE TRANSMISSION: ASSESSMENT OF APPLICABILITY TO ADVANCE ELECTRIC VEHICLES

Stuart H. Loewenthal and Richard J. Parker 1981 32 p refs Presented at the 4th Electric Vehicle Council Symp., Baltimore, 21-23 Oct. 1981

(Contract DE-AI01-77CS-51044)

(NASA-TM-82700; DOE/NASA/51044-23; E-983) Avail: NTIS HC A03/MF A01 CSCL 13F

A brief historical account of the evolution of continuously variable transmissions (CVT) for automotive use is given. The CVT concepts which are potentially suitable for application with electric and hybrid vehicles are discussed. The arrangement and function of several CVT concepts are cited along with their current developmental status. The results of preliminary design studies conducted on four CVT concepts for use in advanced electric vehicles are discussed. R.C.T.

N81-33485# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

EVALUATION OF POWER PROCESSED TURBINE ENGINE BALL BEARINGS Final Technical Report, 19 May - 30 Sep. 1980

Paul F. Brown, Glen A. Bogardus, and John R. Miner Wright-Patterson AFB, Ohio AFWAL Jun. 1981 76 p refs

(Contract F33615-75-C-2009; AF Proj. 3048)

(AD-A103263; PWA-FR-12981; AFWAL-TR-80-2110) Avail: NTIS HC A05/MF A01 CSCL 13/9

Rolling element fatigue life testers, as well as full-scale bearing testers, were used to develop a highly rolling contact fatigue resistant powder processed material (P/M) for use in aircraft turbine engine bearings. Ball and rod elemental tests were conducted, for screening purposes, on three P/M alloys; M-50, T-15 and CRB-7. The best results were realized with the P/M CRB-7 material, a 14 percent chrome corrosion resistant alloy, which demonstrated a B10 life almost twice that of the baseline, conventionally processed VIM-VAR M-50. Twenty full-scale 140 mm ball bearings were subsequently fabricated from P/M CRB-7 alloy. The B10 life realized with these bearings was equivalent to that expected from these same bearings had they been made from conventional VIM-VAR M-50 material. This good result was achieved in spite of an inner ring land wear problem which was alleviated by plating the lands with hard nickel.

Author (GRA)

N81-33486# Vought Corp., Dallas, Tex. Applied Aeronautics Technical Dept.

HYDRAULIC SYSTEM SEAL DEVELOPMENT Final Report, Sep. 1978 - Oct. 1980

Keith E. Whitfill Jun. 1981 335 p

(Contract DAAK51-78-C-0028; DA Proj. 1L1-62209-AH-76) (AD-A103201; USAAVRADCOM-TR-81-D-17) Avail: NTIS HC A15/MF A01 CSCL 01/3

Modern Army Helicopters utilize single- or two-stage hydraulic actuator rod seals that must be capable of operating over the temperature range of -65F to +275F. These actuators are usually exposed to a high concentration of dust during takeoff and/or landing maneuvers and during very low level hover maneuvers. The rotor control actuators are subjected to a large number of small amplitude feedback cycles caused by the load imposed by each rotor blade. Helicopter actuators exposed to the environment described have not provided the desired reliability, maintainability, or safety. The objective of this program was to investigate and develop new and improved multiple cascaded seal configurations for hydraulic systems and actuators, thereby favorably impacting hydraulic system reliability, maintainability, safety, and cost by significantly reducing seal system leakage. The program clearly demonstrated the superiority of the multiple cascaded seal over the single-stage seal and provided data that can be used as a guideline for selection of the optimum number of seals in a given installation. GRA

N81-33487# TRW, Inc., Cleveland, Ohio.

ESTABLISHMENT OF A CUTTING FLUID CONTROL SYSTEM, PHASE 1

G. A. Lieberman Rock Island Arsenal Ill. Jan. 1981 189 p refs

(Contract DAAA08-80-C-0033)

(AD-A103966; AD-E700002; TRW-ER-8121-F; SARRI-EN-81-02) Avail: NTIS HC A09/MF A01 CSCL 11/8

Phase I results are presented for the program entitled 'Establishment of a Cutting Fluid Control System.' The Phase I objectives were to analyze existing Rock Island Arsenal manufacturing processes and requirements, conduct systematic evaluations of available fluid products, and develop a preliminary fluid selection and application matrix. The study showed the majority of observed machining operations involve milling, turning, grinding, and boring procedures on 4100 series steels. A severity index was developed which ranked all these processes relative to machining difficulty with respect to cutting parameters, tool design, workpiece hardness, and specific machining process. Commercially available cutting fluids were also ranked according to composition and manufacturer's recommendations. A total of sixty-five fluids were subjected initially to screening tests involving residue, rust, and bacterial growth with selected fluids then employed in cutting tests. The latter tests employed specially instrumented machine tools which provided force, power consumption, and tool wear data. Results indicate fluid performance levels are not necessarily related to overall product formulations and that milling and turning require significantly different fluid properties. Initial recommendations are presented for a closed-loop fluid reprocessing system. GRA

N81-33488# Westinghouse Electric Corp., Tampa, Fla. Nuclear Equipment Div.

DEVELOPMENT OF AUTOMATED WELDING PROCESS FOR FIELD FABRICATION OF THICK WALLED PRESSURE VESSELS

U. A. Schneider 1981 14 p

(Contract DE-AC05-78ET-13511)

(DE81-025454; DOE/ET-13511/T7) Avail: NTIS HC A02/MF A01

The current state-of-the-art of all heavy section welding processes and welding metallurgy was examined. The following tasks are reported: (1) review of welding processes; (2) adaptation of the GTAW-HW narrow groove process to vertical and horizontal welds; (3) 8 inch thick field demonstration/qualification welds; and (4) welding procedure handbook. Procedure qualification records [TQ 339] are given for the gas tungsten arc/hot wire welding of 2.5 Cr - 1 Mo steel. DOE

N81-33489# Energy and Environmental Analysis, Inc., Arlington, Va.

HEAVY-DUTY ENGINES ANALYSIS, STUDY 2: ANALYSIS OF EMISSION REGULATIONS AND TEST PROCEDURES FOR THE GAS TURBINE ENGINE

K. G. Duleep Jun. 1981 117 p refs Prepared for Argonne National Lab.

(Contract W-31-109-eng-38)

(DE81-029990; ANL/CNSV-TM-74) Avail: NTIS HC A06/MF A01

There is considerable interest in heavy duty gas turbines (HDGT) suitable for use in trucks and buses because of their potential for reduced maintenance, improved fuel economy, better overall reliability, and cleaner exhaust emissions relative to existing (gasoline and diesel) heavy duty engines. This analysis focuses on the application of current and expected emissions measurement techniques to heavy duty gas turbines. The purposes of this report are to: identify emission requirements for heavy duty engines applicable during and after completion of the DOE demonstration program, i.e., 1985; provide an understanding of current steady state test procedures and applicability to the HDGT; describe the development and methodology of the test procedures and sampling techniques to measuring emissions from the HDGT;

and assess the limitations and problems of current sampling techniques for regulated pollutants and identify promising methods of sampling that are applicable to the HDGT. This information should serve as a comprehensive guide to emissions testing requirements and test procedures for the HDGT. DOE

N81-33490# General Electric Co., Schenectady, N. Y. Gas Turbine Div.
DEVELOPMENT OF HIGH-TEMPERATURE TURBINE SUBSYSTEM TECHNOLOGY TO A TECHNOLOGY READINESS STATUS PHASE 2 Quarterly Report, Apr. - Jun. 1981
M. W. Horner Jul. 1981 62 p refs
(Contracts DE-AC01-76ET-10340; EX-76-C-01-1806)
(DE81-025444; DOE/ET-10340/111) Avail: NTIS HC A04/MF A01

A technology readiness vehicle (TRV) to demonstrate the performance of a combined cycle power plant with high temperature gas turbines using coal derived gas fuel was developed. Two major development tests were completed. The first stage composite nozzles were successfully cycled for a total of 617 thermal cycles. In the second test the sectoral combustor was fired first on a propane/steam mixture and then on a synthetic low-Btu (LBtu) gas. The combustor was tested on: the cold and fired flow tests over the operating range, the determination of the effect of varying primary/secondary fuel flow splits, the effects of fuel composition with varying propane/steam ratios, and the determination of the minimum operating (blow out limits) map. Modification of the rotor water delivery and distribution test rig was completed to provide a more positive locking attachment of the water commutator shaft to the test turbine wheel. DOE

N81-33491# Transportation Research Board, Washington, D.C.
INTERACTION BETWEEN VEHICLES AND PAVEMENT SURFACES
John Jewett Henry, James L. Burchett, Roland L. Rizenbergs, S. K. Agrawal, and Roger B. Shakely 1980 42 p refs
(PB81-215253; TRB/TRR-788) Avail: NTIS HC A03/MF A01 CSCL 13F

Wet pavement friction of the primary highway systems was analyzed. The following areas are discussed: (1) use of blank and ribbed test tires for evaluating wet pavement friction; (2) seasonal variations in the skid resistance of pavements in Kentucky; (3) experimental investigation of the transient aspect of hydroplaning; (4) effects of pavement contaminants on skid resistance; and (5) recent developments in pavement texture research. GRA

N81-33323# Stuttgart Univ. (West Germany).
MEASUREMENT OF AIR FLOW IN EXHAUST-DRIVEN TURBOSUPERCHARGER TWO-CYCLE DIESEL ENGINE [MESSUNG DES LUFTDURCHSATZES AN ABGASTURBOAUFGELADENEN SWEITAKTGROSSDIESELMOTOREN]
J. Schroeder (Maschinenfabrik Augsburg-Nuernberg A.G., Augsburg, West Germany) *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 35-51 ref In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33327# Stuttgart Univ. (West Germany).
DYNAMIC BEHAVIOR OF LABYRINTH SEALS [DYNAMISCHES VERHALTEN VON LABYRINTHDICHTUNGEN]
H. Benckert *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 121-142 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33328# Stuttgart Univ. (West Germany).
CONTRIBUTION TO THE INVESTIGATION OF THE NONSTATIONARY OPERATIONAL BEHAVIOR OF COMPRESSOR SYSTEMS. BEHAVIOR DURING PROLONGED PUMP OPERATION [BEITRAG ZUR UNTERSUCHUNG DES INSTATIONAEREN BETRIEBSVERHALTENS VON VERDICHTERANLAGEN - DAS VERHALTEN BEI LAENGER ANDAUERNDEM PUMPBETRIEB]
E. Kohn and K. H. Rohne *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 143-155 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33329# Stuttgart Univ. (West Germany).
ESTIMATION OF THE LOSSES IN CENTRIFUGAL COMPRESSION IMPELLER WHEELS OF DIFFERENT OUTLET WIDTH [ABSCHAETZUNG VON VERLUSTEN IN RADIALVERDICHTERLAUFRAEDERN UNTERSCHIEDLICHER AUSTRITTSBREITE]
B. Woehrl *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 157-174 refs In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33336# Stuttgart Univ. (West Germany).
EXPERIMENTAL INVESTIGATION OF THE VIBRATION CHARACTERISTICS OF LOW-PRESSURE ROTOR BLADES WITH AND WITHOUT INSERTED DAMPING WIRE [EXPERIMENTELLE UNTERSUCHUNG DES SCHWINGUNGSVERHALTENS VON ND-LAUFSCHAUFELN MIT UND OHNE EINGELEGTEN DAEMPFERDRAHT]
I. Wolter *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 299-324 refs In GERMAN Sponsored in part by Deutsche Forschungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33337# Stuttgart Univ. (West Germany).
THE INFLUENCE OF A COVERING BAND ON THE VIBRATION CHARACTERISTICS OF TURBINE BLADES [EINFLUSS DES SCHAUFELDECKBANDES AUF DAS SCHWINGUNGSVERHALTEN VON TURBINENSCHAUFELN]
H. Wolfs *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 325-342 refs In GERMAN Sponsored by Deutsche Forschungsgeimschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N81-33492*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELIABILITY AND QUALITY ASSURANCE ON THE MOD 2 WIND SYSTEM
W. E. B. Mason and B. G. Jones (Boding Engineering and Construction Co., Seattle, Wash.) 1981 16 p refs Presented at 5th Biennial Wind Energy Conf. and Workshop, Washington, 5-7 Oct. 1981; sponsored by Solar Energy Res. Inst. and DOE (Contract DE-AI01-79ET-20305)
(NASA-TM-82717; DOE/NASA/20305-6; E-1015) Avail: NTIS HC A02/MF A01 CSCL 14D

The Safety, Reliability, and Quality Assurance (R&QA) approach developed for the largest wind turbine generator, the Mod 2, is described. The R&QA approach assures that the machine is not hazardous to the public or to the operating personnel, is operated unattended on a utility grid, demonstrates reliable operation, and helps establish the quality assurance and maintainability requirements for future wind turbine projects. The significant guideline consisted of a failure modes and effects analysis (FMEA) during the design phase, hardware inspections during parts fabrication, and three simple documents to control activities during machine construction and operation. E.A.K.

N81-33493# Orplan/Sonica Inspecoes Industriais Ltda., Sao Paulo (Brazil).
INTRODUCTION TO ACOUSTIC EMISSION
L. X. Nepomuceno 7 Oct. 1981 20 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Seminar on Nondestructive Testing of ABENDE: Brazilian Assoc. for Nondestructive Testing, San Paulo, Brazil, 5-7 Oct. 1981

Avail: NTIS HC A02/MF A01

An elementary introduction to the acoustic emission techniques are presented with emphasis on the fundamental aspects that govern the process. A brief historical review is given on how the technique is developed. Some of the practical applications covered are: materials properties research; monitoring and characteristics of structures; and applications in weldments quality control and monitoring. R.C.T.

N81-33494# Michigan Univ., Ann Arbor.
HOLOGRAPHIC NDE: STATUS AND FUTURE Final Report
C. M. West May 1981 78 p refs
(Contract NB79-NAAB-4598)
(PB81-207409; NBS-GCR-81-318) Avail: NTIS HC A05/MF A01 CSCL 14B

The current role and future potential of optical holographic interferometry for nondestructive evaluation of materials and components was examined. The sources of data and information which formed the basis of the study, followed by a brief exposition of principles and techniques of holographic NDE are described. The technical literature and the cited references are categorized. The status and future of holographic NDE is analyzed. Conclusions are offered in the form of a response to the inquiries. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N81-33495*# Akron Univ., Ohio. Dept. of Mechanical Engineering.
SELF-ADAPTIVE PREDICTOR-CORRECTOR ALGORITHM FOR STATIC NONLINEAR STRUCTURAL ANALYSIS Interim Report
Joseph Padovan Apr. 1981 58 p refs
(Grant NAG3-54)
(NASA-CR-165410; JP-81-1) Avail: NTIS HC A04/MF A01 CSCL 20/11

A multiphase selfadaptive predictor corrector type algorithm was developed. This algorithm enables the solution of highly nonlinear structural responses including kinematic, kinetic and material effects as well as pro/post buckling behavior. The strategy involves three main phases: (1) the use of a warpable hyperelliptic constraint surface which serves to upperbound dependent iterate excursions during successive incremental Newton Ramphson (INR) type iterations; (2) uses an energy constraint to scale the generation of successive iterates so as to maintain the appropriate form of local convergence behavior; (3) the use of quality of convergence checks which enable various self adaptive modifications of the algorithmic structure when necessary. The restructuring is achieved by tightening various conditioning parameters as well as switch to different algorithmic levels to improve the convergence process. The capabilities of the procedure to handle various types of static nonlinear structural behavior are illustrated. E.A.K.

N81-33496*# Boeing Engineering and Construction, Seattle, Wash.
WIND LOADS ON FLAT PLATE PHOTOVOLTAIC ARRAY FIELDS (NONSTEADY WINDS) Final Report
Ronald D. Miller and Donald K. Zimmerman Aug. 1981 96 p refs Sponsored by NASA and DOE Prepared for JPL, California Inst. of Tech., Pasadena
(Contract JPL-954833)
(NASA-CR-164745; DOE/JPL-954833-81/4; JPL-9950-594) Avail: NTIS HC A05/MF A01 CSCL 20K

Techniques to predict the dynamic response and the structural dynamic loads of flat plate photovoltaic arrays due to wind turbulence were analyzed. Guidelines for use in predicting the turbulent portion of the wind loading on future similar arrays are presented. The dynamic response and the loads dynamic magnification factor of the two array configurations are similar. The magnification factors at a mid chord and outer chord location on the array illustrated and at four points on the chord are shown. The wind tunnel test experimental rms pressure coefficient on which magnification factors are based is shown. It is found that the largest response and dynamic magnification factor occur at a mid chord location on an array and near the trailing edge. A technique employing these magnification factors and the wind tunnel test rms fluctuating pressure coefficients to calculate design pressure loads due to wind turbulence is presented. E.A.K.

N81-33497*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURAL DYNAMICS VERIFICATION FACILITY STUDY
Louis J. Kiraly, Murray S. Hirchbein, James M. McAleese, and David P. Fleming Aug. 1981 21 p refs
(NASA-TM-82675; E-958) Avail: NTIS HC A02/MF A01 CSCL 20K

The need for a structural dynamics verification facility to support structures programs was studied. Most of the industry operated facilities are used for highly focused research, component development, and problem solving, and are not used for the generic understanding of the coupled dynamic response of major engine subsystems. Capabilities for the proposed facility include: the ability to both excite and measure coupled structural dynamic response of elastic blades on elastic shafting, the mechanical simulation of various dynaical loadings representative of those seen in operating engines, and the measurement of engine dynamic deflections and interface forces caused by alternative engine mounting configurations and compliances. E.A.K.

N81-33498*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BUCKLING LOADS FOR STIFFENED PANELS SUBJECTED TO COMBINED LONGITUDINAL COMPRESSION AND SHEAR LOADINGS: RESULTS OBTAINED WITH PASCO, EAL, AND STAGS COMPUTER
W. Jefferson Stroud, William H. Greene, and Melvin S. Anderson Oct. 1981 65 p refs
(NASA-TM-83194) Avail: NTIS HC A04/MF A01 CSCL 20K

The shear buckling analyses used in PASCO are summarized. The PASCO analyses include the basic VIPASA analysis, which is essentially exact for longitudinal and transverse loads, and a smeared orthotropic solution which was added to alleviate a shortcoming in the VIPASA analysis. Buckling results are presented for six stiffened panels loaded by combinations of longitudinal compression and shear. The buckling results were obtained with the PASCO, EAL, and STAGS computer programs. The EAL and STAGS solutions were obtained with a fine finite element mesh and provide calculations for the entire range of combinations of longitudinal compression and shear loadings. E.A.K.

N81-33499*# Lehigh Univ., Bethlehem, Pa.
TIME-TEMPERATURE EFFECT IN ADHESIVELY BONDED JOINTS
F. Delale and F. Erdogan Feb. 1981 33 p refs
(Grants NGR-39-007-011; NSF CME-78-09737)
(NASA-CR-165775) Avail: NTIS HC A03/MF A01 CSCL 20K

The viscoelastic analysis of an adhesively bonded lap joint was reconsidered. The adherends are approximated by essentially Reissner plates and the adhesive is linearly viscoelastic. The hereditary integrals are used to model the adhesive. A linear integral differential equations system for the shear and the tensile stress in the adhesive is applied. The equations have constant coefficients and are solved by using Laplace transforms. It is shown that if the temperature variation in time can be approximated by a piecewise constant function, then the method of Laplace transforms can be used to solve the problem. A numerical example is given for a single lap joint under various loading conditions. E.A.K.

N81-33500*# Lehigh Univ., Bethlehem, Pa.
THE CRACK PROBLEM FOR A HALF PLANE STIFFENED BY ELASTIC COVER PLATES
F. Delale and F. Erdogan Feb. 1981 36 p refs
(Grants NGR-39-007-011; NSF CME-78-09737)

(NASA-CR-165776) Avail: NTIS HC A03/MF A01 CSCL 20K

An elastic half plane containing a crack and stiffened by a cover plate is discussed. The asymptotic nature of the stress state in the half plane around an end point of the stiffener to determine the likely orientation of a possible fracture initiation and growth was studied. The problem is formulated for an arbitrary oriented radial crack in a system of singular integral equations. For an internal crack and for an edge crack, the problem is solved and the stress intensity factors at the crack tips and the interface stress are calculated. A cracked half plane with two symmetrically located cover plates is also considered. It is concluded that the case of two stiffeners appears to be more severe than that of a single stiffener. E.A.K.

N81-33501*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CURRENT RESEARCH ON SHEAR BUCKLING AND THERMAL LOADS WITH PASCO: PANEL ANALYSIS AND SIZING CODE

W. Jefferson Stroud, William H. Greene, and Melvin S. Anderson Sep. 1981 13 p refs Presented at Intern. Symp. on Optimal Structural Design, the 11th Naval Mech. Symp., Tucson, Ariz., 19-22 Oct. 1981

(NASA-TM-83206) Avail: NTIS HC A02/MF A01 CSCL 20K

The PASCO computer program to obtain the detailed dimensions of optimum stiffened composite structural panels is described. Design requirements in terms of inequality constraints can be placed on buckling loads or vibration frequencies, lamina stresses and strains, and overall panel stiffness for each of many load conditions. General panel cross sections can be treated. An analysis procedure involving a smeared orthotropic solution was investigated. The conservatism in the VIPASA solution and the danger in a smeared orthotropic solution is explored. PASCO's capability to design for thermal loadings is also described. It is emphasized that design studies illustrate the importance of the multiple load condition capability when thermal loads are present. E.A.K.

N81-33502*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EFFECT OF LOAD ECCENTRICITY AND SUBSTRUCTURE DEFORMATION ON ULTIMATE STRENGTH OF SHUTTLE ORBITER THERMAL PROTECTION SYSTEM

James Wayne Sawyer Sep. 1981 32 p refs

(NASA-TM-83182) Avail: NTIS HC A03/MF A01 CSCL 20K

The effect of load eccentricity and substructure deformation on the ultimate strength and stress displacement properties of the shuttle orbiter thermal protection system (TPS) was determined. The LI-900 Reusable Surface Insulation (RSI) tiles mounted on the .41 cm thick Strain Isolator Pad (SIP) were investigated. Substructure deformations reduce the ultimate strength of the SIP/tile TPS and increase the scatter in the ultimate strength data. Substructure deformations that occur unsymmetric to the tile can cause the tile to rotate when subjected to a uniform applied load. Load eccentricity reduces SIP/tile TPS ultimate strength and causes tile rotation. E.A.K.

N81-33503# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

MANUAL ON THE FATIGUE OF STRUCTURES. 2: CAUSES AND PREVENTION OF DAMAGE. 7: MECHANICAL SURFACE DAMAGE

W. G. Barrois (l'Armement (Air), Vanves, France) Jun. 1981 140 p refs

(AGARD-MAN-10(ENG); ISBN-92-835-1389-4) Avail: NTIS HC A07/MF A01

Surface damage to aircraft structures is often the origin of fatigue cracks. Damage arising from decarburization and wheel grinding; friction and severe wear; rolling fatigue; contact fatigue; fretting fatigue; and erosion by solid and liquid particles and cavitation is examined. Damage in gears, cams, rails, and bearings are discussed as well as to the surface of metals transparent materials, reinforced plastics, and laminates. A.R.H.

N81-33504# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

STRESS INTENSITY FACTORS FOR RADIAL CRACKS IN A PARTIALLY AUTOFRETTAGED THICK-WALL CYLINDER

S. L. Pu and M. A. Hussain Jul. 1981 40 p refs Presented at the 14th Natl. Symp. on Fracture Mech., Los Angeles, Calif. 29 Jun. - 1 Jul. 1981

(DA Proj. 1L1-61102-AH-60)

(AD-A103208; ARLCB-TR-81027) Avail: NTIS HC A03/MF A01 CSCL 20/11

Using a finite element method and thermal simulation, stress intensity factors are determined for a uniform array of equal depth radial cracks emanating from the internal boundary of a pressurized, autofrettaged thick-wall cylinder. Computations of the stress intensity factors by methods of load relief and weight function are also examined. The combination of finite elements and weight functions is found very effective and is used in this report for multiple-radial cracks in a partially autofrettaged tube. Extensive numerical results are presented for a cylinder having an external diameter twice that of the internal diameter. It is shown that the autofrettaged tube with two diametrically opposed cracks remains, in general, the weakest configuration. For more than two cracks, the higher the number of cracks is, the smaller the stress intensity factor will be. Author (GRA)

N81-33505# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

NUMERICAL SOLUTION TO BEAM VIBRATIONS UNDER A MOVING COUPLE

J. J. Wu Aug. 1981 35 p refs Presented at Army Numerical Analysis and Computer Conf., Huntsville, Ala., 26-27 Feb. 1981

(AD-A103387; ARLCB-TR-81031) Avail: NTIS HC A03/MF A01 CSCL 19/6

The finite element solution formulation in time-and space-coordinates is extended to beam vibrations effected by a moving couple. This problem has direct application to gun motions analysis with an unbalanced moving projectile. The moving load, instead of being a time-dependent Dirac delta function as for the case of a moving concentrated force, is now the derivative of this Dirac delta function. This singular function does not present any difficulty due to the variational process employed. This solution procedure is described together with results of beam motions subjected to a couple moving with various speeds.Author (GRA)

N81-33506# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

STRUCTURAL ANALYSIS OF A KINETIC ENERGY PROJECTILE DURING LAUNCH

G. A. Pflegl, J. H. Underwood, and G. P. OHara Jul. 1981 25 p refs

(AD-A103475; ARLCB-TR-81028) Avail: NTIS HC A02/MF A01 CSCL 19/1

This paper presents the results of a three phase effort to quantify the structural integrity of a long rod kinetic energy penetrator projectile during launch. The first phase used the finite element method to investigate the two body problem of penetrator and sabot during peak launch loads. This portion of the analysis considered the effect of pressure loading, body forces, and different moduli to determine an estimate of the stresses present in the penetrator and sabot - particularly along the intersection between the two. These stresses were then used to determine the load transfer between the penetrator and sabot. The second phase of the effort applied the load transfer from phase one to a detailed finite element model of the thread-like lugs of the penetrator in order to determine the stress concentrations in the notch root area between the lugs. This portion of the work took into account the geometry, material properties, and load transfer of the lugs. The resulting stresses due to the shearing and bending loads and contact friction were analyzed to determine the location and magnitude of the largest tensile stresses at the surface of the lug root. The value of maximum tensile stress in the root of the penetrator lugs was then used in a fracture mechanics analysis to determine a critical flow size which would cause brittle fracture. Using fracture toughness measurements from depleted uranium penetrator materials, critical flaw sizes

were calculated and used to determine the likelihood of failure during launch and to formulate NDT inspection standards.
Author (GRA)

N81-33507# Naval Research Lab., Washington, D. C. Mechanics of Materials Branch.
STANDARD METHOD OF TEST FOR CONSTANT-LOAD-AMPLITUDE FATIGUE CRACK GROWTH RATES IN MARINE ENVIRONMENTS Final Report
T. W. Crooker, F. D. Bogar, and G. R. Yoder 6 Aug. 1981 26 p refs
(SF61541502)
(AD-A103195; NRL-MR-4594) Avail: NTIS HC A03/MF A01 CSCL 20/11

The determination of fatigue crack growth rates in marine environments is known to be influenced by numerous experimental factors. Therefore, it is necessary to formulate a standard method of test to assure uniformity of test results. This report describes recommended procedures for the measurement of fatigue crack growth rates for metallic materials tested in marine corrosion environments. Author (GRA)

N81-33508# Northwestern Univ., Evanston, Ill. Technological Inst.
BOUNDS ON THERMAL STRESSED IN SPHERES
B. A. Boley and S. R. Boley May 1981 7 p refs
(Contract N00014-75-C-1042; NR Proj. 064-401)
(AD-A103156; TR-1981-1) Avail: NTIS HC A02/MF A01 CSCL 20/13

It is often easy to secure estimates for the highest and lowest temperatures to be expected in a structure, but it is much more difficult to obtain detailed information on the temperature distribution itself, short of a complete solution of the problem. It has been found possible, and quite useful, in many cases, to determine the maximum possible thermal stress which may develop, solely on the basis of the known bounds on the temperature. Upper and lower bounds on the thermal stresses and deformations have been constructed in this way for beams and plates and for composite structures. Applications of these bounds have been developed in the estimate of errors in approximate calculations and in the analysis of thermal reduction of beam torsional rigidity, as well as, of course, in many practical design estimates. The present paper develops similar bounds for the thermal stresses which may arise in solid or hollow spheres. The temperature distributions considered are axisymmetric, and are otherwise either arbitrary or radially monotonic. Author (GRA)

N81-33509# Princeton Univ., N. J. Dept. of Civil and Geological Engineering.
NONLOCAL EFFECTS IN BRITTLE CRACK PROPAGATION
Nasit Ari and A. C. Eringen Jul. 1981 41 p refs
(Contract N00014-76-C-0240; NR Proj. 064-410)
(AD-A103171; Rept-81-SM-24; TR-56) Avail: NTIS HC A03/MF A01 CSCL 20/11

Stress distribution near the tip of a constant velocity crack is determined by means of nonlocal theory of elasticity. The maximum stress is finite and it allows one to utilize the maximum stress hypothesis to determine the terminal velocity of running cracks. Author (GRA)

N81-33510# Dayton Univ., Ohio. Research Inst.
MEASUREMENT OF OUT-OF-PLANE DISPLACEMENTS: USERS MANUAL FOR THE MOIRE FRINGE DEFLECTION MEASUREMENT DEVICE Final Report, May - Nov. 1980
Andrew J. Piekutowski Mar. 1981 52 p refs
(Contract F33615-80-C-3401; AF Proj. 1926)
(AD-A103323; UDR-TR-80-109; AFWAL-TR-81-3006) Avail: NTIS HC A04/MF A01 CSCL 20/14

Instructions for use of the UDRI moire fringe device are provided in this report. Detailed instructions for analysis of the moire fringe patterns produced by the device are also presented. A listing of statements in a computer program named PANDIS is given. This program, written in the BASIC language is used to reduce data obtained during analysis of the fringe patterns to out-of-place displacement data. A test problem, including sample data and output, is also presented. Author (GRA)

N81-33511# Dayton Univ., Ohio. Research Inst.
A DEVICE TO DETERMINE THE OUT-OF-PLANE DISPLACEMENT OF A SURFACE USING A MOIRE FRINGE TECHNIQUE Final Technical Report, Jul. 1978 - Apr. 1979
Andrew J. Piekutowski Mar. 1981 40 p refs
(Contract F33615-76-C-3103; AF Proj. 2202)
(AD-A103259; UDR-TR-79-58; AFWAL-TR-81-3005) Avail: NTIS HC A03/MF A01 CSCL 14/2

A brief review of various techniques to produce moire patterns for use in making in-plane and out-of-plane displacement measurements is presented. A detailed description of a device which uses one of these techniques to obtain quantitative measurement of the out-of-plane displacement of surfaces experiencing dynamic stimulation is also given. High-speed photography of images formed by the device is used to provide a series of photographs which are analyzed to provide a time-sequence description of the motion of the deformed surface. Examples of measurement of the response of simulated fuel tank panels subjected to the impact of high-speed fragments and the response of aircraft transparencies experiencing a birdstrike are presented. Author (GRA)

N81-33512# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
STRUCTURAL INELASTICITY 27
Philip G. Hodge, Jr. and James Malone Apr. 1981 65 p refs Submitted for publication
(Contract N00014-75-C-0177; NR Proj. 064-429)
(AD-A103281; AEM-H1-27) Avail: NTIS HC A04/MF A01 CSCL 13/13

A tutorial review is presented of some of the computer methods useful in the plastic analysis of structures. Each method is illustrated with a trivially simple problem which can be solved without a computer and by one or more larger problems solved with the aid of a computer. The methods described include direct elastic plastic analysis, linear programming, gradient and simplex methods for unconstrained minimization, the SUMT method for constrained minimization, and use of finite-element methods for plate problems. Applications are made to trusses, frames, grids, arches, and plates. Author (GRA)

N81-33513# Universal Energy Systems, Inc., Dayton, Ohio.
A KINETIC ANALYSIS OF HIGH TEMPERATURE FATIGUE CRACK GROWTH Final Report, Apr. - Sep. 1980
H. W. Liu (Syracuse Univ., N.Y.) and J. J. McGowan (Alabama Univ.) Wright-Patterson AFB, Ohio AFWAL Jun. 1981 16 p refs
(Contract F33615-79-C-5129; AF Proj. 2307)
(AD-A104209; AFWAL-TR-81-4036) Avail: NTIS HC A02/MF A01 CSCL 11/6

The increased fatigue crack growth rate at high temperature is primarily caused by environmental effects. The amount of the environmental effect depends on the penetration rate of the detrimental chemical specie relative to the crack growth rate. Depending upon the relative chemical penetration rate, there can either be no, partial, or full environmental effects. In both cases of no or full environmental effects, da/dN is not sensitive to cyclic frequency and temperature. In the case of partial environmental effect, da/dN is controlled by the rate of the transport of the detrimental chemical specie to crack tip, and da/dN is both frequency and temperature dependent. The da/dN data of IN 100, Waspaloy, and 304 stainless steel were analyzed. The data seem to support the analysis. Author (GRA)

N81-33514# Lockheed Missiles and Space Co., Palo Alto, Calif. Applied Mechanics Lab.
INTERACTIVE NONLINEAR STRUCTURAL ANALYSIS: ENHANCEMENT Final Report
G. M. Stanley 31 Jul. 1981 233 p refs
(Contract N00014-80-C-0831)
(AD-A103801; LMSC-D811535) Avail: NTIS HC A11/MF A01 CSCL 13/13

GIST is a system for performing Nonlinear Finite-Element Structural Analysis in an Interactive, Graphics-Oriented computational environment. The system constitutes a network of integrated software processors, i.e., independently executable computer programs, collectively referred to as the GIFTS/STAGS Software Assembly, or more concisely as GIST. This network is analogous

to a computer operating system, which enables the user to perform a wide variety of operations accessible through a common 'command' (or 'control') language. Many of these operations are actually performed by independent processors which are linked through a 'global database' to behave as an integrated system. Thus, GIST may be regarded as a special-purpose (or 'virtual') operating system for structural analysis, where instead of text editors, compilers and file handlers, GIST employs model editors, structural analyzers and solution post-processors as basic components. Furthermore, the user addresses the GIST 'operating system' in a Problem-Oriented Command Language, and is free (by virtue of the global database) to exercise the system in a 'reasonably' arbitrary fashion, with frequent stops and restarts. GRA

N81-33515# Pittsburg Univ., Pa. Inst. for Computational Mathematics and Applications.

COMPUTATIONAL ERROR ESTIMATES AND ADAPTIVE PROCESSES FOR SOME NONLINEAR STRUCTURAL PROBLEMS

Ivo Babuska (Maryland Univ., College Park) and Werner C. Rheinboldt Jul. 1981 93 p refs

(Contract N00014-80-C-0455; Grant NSF MCS-78-05299)

(AD-A103955; ICMA-81-28) Avail: NTIS HC A05/MF A01 CSCL 13/13

In earlier papers the authors introduced and analyzed the calculation of reliable, a posteriori error estimates for finite element solutions and discussed the design and effectivity of adaptive procedures based upon them. While most of this work concerned linear problems, this paper is intended to show that the same approaches remain also highly effective in the nonlinear case. As a model problem a planar, elastic rod is considered involving both material as well as geometrical nonlinearities; but, as far as possible the discussion is kept general. For nonlinear problems of this type interest centers on an analysis of the shape and features of the equilibrium surface. After some general remarks about such surfaces and the related computational problems, a general continuation process is summarized and some of its extensions for determining limit points and tracing stability paths are discussed. The estimators are introduced for the error along the solution paths and of the computed critical values. Experimental results for the model problem show the effectivity of these estimators and of the adaptive procedures based upon them. Then some aspects relating to the occurrence and identification of spurious solutions are discussed. In order to illustrate desirable generalizations of these results, the paper ends with an outline of some results for linear problems of the type that should be achievable also in the nonlinear case. Author (GRA)

N81-33516# Georgia Inst. of Tech., Atlanta. Center for the Advancement of Computational Mechanics.

AN ANALYSIS OF, AND SOME OBSERVATIONS ON, DYNAMIC FRACTURE IN AN IMPACT TEST SPECIMEN Interim Report

T. Nishioka, M. Perl, and S. N. Atluri Jul. 1981 13 p refs

(Contract N00014-78-C-0636; NR Proj. 064-610)

(AD-A104216; GIT-CACM-SNA-10; TR-12) Avail: NTIS HC A02/MF A01 CSCL 11/6

Numerical simulations of crack-propagation histories in four cases of dynamic tear test experiments on 4340 steel are performed. The influence of the loss of contact of the specimen at various times with either the supports or the tup or both is critically examined. In each case, the variation of the dynamic K-factor, for the simulated crack-propagation history, is directly computed. The results are discussed in the light of current controversies surrounding the dynamic fracture toughness properties governing crack-propagation under impact loading. It is concluded that these controversies may not be fully warranted. Author (GRA)

N81-33517# California Univ., Livermore. Lawrence Livermore Lab.

APPLICATIONS OF SYSTEMS THEORY TO STRUCTURAL ANALYSIS

H. J. Weaver Jul. 1981 57 p refs

(Contract W-7405-eng-48)

(DE81-028496; UCRL-53094) Avail: NTIS HC A04/MF A01

The transfer function model of a structure is discussed. The model can be used to predict the response motions of the structure resulting from either a single loading or combination of loading, or forcing, conditions or a combination of the two. The use of transfer function models has two main advantages: (1) the models are used in conjunction with frequency domain, or Fourier, analysis techniques, tremendous computational efficiency via the fast Fourier transform (FFT) algorithm is possible; (2) a model can be constructed directly from data obtained by simple vibrational tests performed on a structure. DOE

N81-33518# Ames Lab., Iowa.

DISPLACEMENT DISCONTINUITY METHOD APPLIED TO NDE-RELATED STRESS PROBLEMS

L. W. Zachary and B. J. Skillings 1981 26 p refs Presented at the 17th Midwestern Mech. Conf., Ann Arbor, Mich., 6-8 May 1981

(Contract W-7405-eng-82)

(DE81-024003; IS-M-328; CONF-810587-1) Avail: NTIS HC A03/MF A01

The use of Crouch's displacement discontinuity method (DDM) to model surface and subsurface flaws is illustrated. The method has a built in semi-infinite solution that is very advantageous in the surface and near surface problems. The method is also illustrated on finite width plates. The DDM is a powerful tool especially when applied to cracks. It is used to its use with nondestructive evaluation (NDE) related problems is very helpful. It is used to determine which parameters of a flaw such as size, shape, and orientation are the most important from a fracture mechanics point of view. The NDE techniques having the ability to obtain these parameters is used on the particular problem. DOE

N81-33519# Northeastern Forest Experiment Station, Broomall, Pa.

THE SERPENTINE END-MATCHED JOINT: EVALUATING STRENGTH AND STABILITY Final Forest Service Research Paper

Charles J. Gatchell and Curtis C. Peters 1981 12 p refs

(PB81-215535; NEFES/81-255; FSRP/NE-485) Avail: NTIS HC A02/MF A01 CSCL 11L

The Serpentine end matched (sem) joint, a precisely machined butt joint with a sine wave shape is described. The joint performs well in panels made of sugar maple, red oak, black walnut, and black cherry. The sem joint is unaffected by changes in equilibrium moisture content from 6 to 12 to 18 to 6. Panels with sem joints have the same stiffness as panels without sem joints. However, the panels had to bend much farther than nonstructural applications would dictate before failure occurred. GRA

N81-34137# Battelle Columbus Labs., Ohio.

THE ROLE OF SIMILITUDE IN FATIGUE AND FATIGUE CRACK GROWTH ANALYSES

B. N. Leis and D. Broek *In* The Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. 8 Aug. 1981 p 15-28 refs (For primary document see N81-34135 24-99)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

N81-33335# Stuttgart Univ. (West Germany).

THE INFLUENCE OF THE AXIAL DISTANCE ON THE ALTERNATING EXPANSION STRESS OF A TURBINE WHEEL [EINFLUSS DES AXIALSPALTES AUF DIE WECHSELDEHNUNGSBEANSPRUCHUNG EINES TURBINENLAUFRADES]

J. Beckmann *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 283-298 refs In GERMAN (For primary document see N81-33321 24-31)

Avail: NTIS HC A16/MF A01

N81-33338# Stuttgart Univ. (West Germany).

STRESS DISTRIBUTION OF A FREE LOW-PRESSURE BLADE [DIE SPANNUNGSVERTEILUNG EINER FREISTEHENDEN NIEDERDRUCKSCHAUFEL]

R. Pfeiffer *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 343-354 refs In GERMAN (For primary document see N81-33321 24-31)

Avail: NTIS HC A16/MF A01

42 GEOSCIENCES (GENERAL)

N81-33520*# Lunar and Planetary Inst., Houston, Tex.
PAPERS PRESENTED TO THE CONFERENCE ON LARGE BODY IMPACTS AND TERRESTRIAL EVOLUTION: GEOLOGICAL, CLIMATOLOGICAL, AND BIOLOGICAL IMPLICATIONS
1981 78 p refs Conf. held at Snowbird, Utah, 19-22 Oct. 1981
(Contract NASw-3389)
(NASA-CR-164880; LPI-Contrib-449) Avail: NTIS HC A05/MF A01 CSCL 08G

The effects of large impacts on the environment are discussed and include thermal effects, atmospheric effects, changes in ocean temperatures, and geomagnetic anomalies. Biological factors such as extinction and increases in mutation development were investigated. Geological anomalies studied include stratigraphic gaps, extinction of entire boundary layers from the geological record, and geochemical oddities. Evidence was examined for impact cratering throughout the world. T.M.

N81-33521# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1: ORIGINAL REPORTS, NUMBER 80 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 80]
1980 92 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(ISSN-0469-4236) Avail: NTIS HC A05/MF A01

Computer aided cartography, where automated voice recognition and disentanglement of overlapping zones of broadened cartographic line elements are considered. Map production and reproduction, with a survey of cartographic techniques used in China, and a comparative test program on reproduction by color separation procedures are included. Geodesy, using position determinations by Doppler navigation satellites for mapping in Colombia is described. For individual titles, see N81-33522 through N81-33526.

N81-33522# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
POSITION MEASUREMENTS IN COLOMBIA BY MEANS OF SATELLITE OBSERVATIONS [POSITIONSBESTIMMUNGEN IN KOLUMBIEN MITTELS SATELLITENBEOBACHTUNGEN] **c43**
Walter Etling *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 5-11 In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

A number of positions on the Earth were determined by means of Doppler measurements using the Navy navigation satellite system in support of a seismic measurement compaign conducted in Colombia. The transformation of the initial geocentric system to the required terrestrial coordinate systems is discussed. It is shown that the positions of the points to be measured can be determined with an accuracy sufficient for cartographic purposes using only a restricted number of satellite passages. Experimentation under conditions pertaining to Colombia is also commented on. Author (ESA)

N81-33523# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATED VOICE RECOGNITION IN COMPUTER AIDED CARTOGRAPHY [AUTOMATISCHE SPRACH-ERKENNUNG IN DER RECHNERGESTUETZEN KARTOGRAPHIE] **c43**
Theodor M. Johannsen *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 13-26 refs In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

The operation of a voice input unit and its range of application in cartography are discussed. Sound pattern analysis, voice recognition training and computer integration are reviewed. The main advantage for cartographic applications is indicated to be the easing of the operator's task at the digitizer since he no longer needs to divert his concentration away from the graphical original. Further improvements through acoustical computer response are also discussed. Author (ESA)

N81-33524# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPRODUCTION OF LAND MAP CIRCULATION RUNS BY MEANS OF COLOR SEPARATION PROCEDURES [NACHDRUCK VON LANDKARTEN-AUFLAGENDRUCKEN MITTELS FARBAUSZUGSVERFAHREN] **c43**
Helmut Muehle *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 27-74 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

A ten colored land map circulation run of the General Topographic Map 1 : 200,000 was used as reflection copy in comparative tests on color separation procedures involving three and four colors (without and with black). A conventional standard-direct half-tone procedure and an original procedure using compensative masking were investigated and the factors that influence the quality of the reproduction concerning color and resolving power of line elements are identified. The capabilities of the re-enlargement and the multiple exposure methods for compensating the difference between the larger format of the original and the smaller format of the photo-material are assessed. Practical hints and tables on half-tome modification values in case of re-enlargement are included to enable the selection of a suitable reproduction method. The original contains color illustrations. Author (ESA)

N81-33525# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
OVSUP: A PROGRAM FOR COMPUTER-AIDED DISENTANGLEMENT OF OVERLAPPING ZONES [OVSUP: EIN PROGRAMM ZUR EDV-GESTUETZTEN ENTFLECHTUNG DER UEBERLAPPUNGSSTELLAN VERBREITER LINIENHAFTER KARTENELSENENTE] **c43**
Roland Schittenhelm *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 75-82 refs In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

A computer program (OVSUP) was developed to disentangle overlapping zones of broadened cartographic line elements by computing the amount of displacement of single points. OVSUP is run in combination with a subroutine OVPREC which finds the beginning and the end of such overlapping zones automatically. A survey is made of the program structure, the functioning of its subroutines, and the conditions for application. The computer output is in the form of a vector containing the coordinates of the displaced points. A practical application illustrates the procedure. Author (ESA)

N81-33526# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PHOTOGRAMMETRY IN CHINA **c43**
Zhi-zhou Wang (Wuhan Coll. of Geodesy, Photogrammetry and Cartography, China) *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 83-89 In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

Past and present developments in China in the field of photogrammetry and survey are summarized. The production of topographic maps at scales 1 : 100,000 and 1 : 50,000 produced by topogrammetic techniques is discussed. Base map production at scale 1 : 10,000 using aerial imagery, analytical block adjustment, computer bundle adjustment, and preliminary orthophoto production is described. Photogrammetric research on digital correlation of stereophotography on production and application of digital terrain models, and on geometrical remote sensing data processing are treated. Author (ESA)

N81-33527# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1:

ORIGINAL REPORTS, NUMBER 81 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1: ORIGINALBEITRAERE]
1980 134 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(ISSN-0469-4236) Avail: NTIS HC A07/MF A01

The application of automatic data processing to cartography is discussed. Software development, with contributions to object extraction, network synthesis, graphical kernel systems, and height model construction is considered. Configuration descriptions of global cartographic data base systems and applications in the fields of geological surveys, electrical supply grids, and marine navigation are presented. For individual titles, see N81-33528 through N81-33537.

N81-33528# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PARTIALLY AUTOMATED OBJECT EXTRACTION FROM AERIAL PHOTOGRAPHS AND LAND MAPS [TEILAUTOMATISCHE OBJELTEXTRAKTION AUS LUFTBILDERN UND LANDKARTEN] **c43**
U. Bausch, W. D. Groch, W. Kestner, and M. Sties *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 7-22 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

Object controlled object extraction procedures are presented. Compared with systematic area covering methods such procedures are expected to use less computer time at lower error rates. The principles of methods for extracting linear, surface, and point features are explained, and their accuracy and quality are discussed. The local judgement of gray value profiles for the determination of object outlines is dealt with in detail. One dimensional operators are introduced assigning evaluation numbers to the image points of an image extract. The higher the number; the higher the probability is for a point to lie on a contour. In this way candidates for an object outline are filtered from the selected image range. The various methods were simulated on a computer and tested using different imagery material. Results are shown. Author (ESA)

N81-33529# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
LAND INFORMATION SYSTEMS: AN ATTEMPT AT DELIMINATION [LANDINFORMATIONSSYSTEME: EIN VERSUCH ZU EINER ABGRENZUNG] **c82**
Andre Frank *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 23-30 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

A delimitation is proposed of the terms geographical information system and 'land information system' as subgroups of earth information storage and retrieval systems. By means of a study of model-formation and abstraction processes a difference is made between primary models and derived models. It is recognized that the former correspond to the typical requirements of administrations whereas the latter are particularly useful for planning and science. It is proposed to reserve the term 'land information system' for the first category and use 'geographical information system' for derived systems of a higher degree of abstraction. Author (ESA)

N81-33530# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PRACTICAL APPLICATION OF GRAPHICAL DATA PROCESSING FOR TASKS OF GEOLOGICAL SURVEYS [PRAKTISCHE ANWENDUNG DER GRAPHISCHEN DATENVERARBEITUNG FUER AUFGABEN GEOLOGISCHERDIENSTE] **c46**
Gottfried Gabert and Bernard Schmidt *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 31-41 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

Hardware configuration, software functions and usage of the interactive graphical system installed at the Federal Institute for Geosciences and Natural Resources at Hannover, Germany are described and its present and future applications in establishing graphical data bases are indicated. By attribution of special headings and user codes to the different topographical and geographical elements it is possible to retrieve individual groups of graphical data corresponding to specific criteria of mapping for topography and geology. Author (ESA)

N81-33531# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SEDAN: A PROGRAM SYSTEM FOR ACQUISITION, REPRESENTATION, ACTUALIZATION, AND FILING OF NETWORKS [SEDAN: PROGRAMMSYSTEM ZUR ERFASSUNG, DARSTELLUNG, AKTUALISIEURUNG UND ARCHIVIERUNG VON NETZEN] **c82**
Friedrich vonKlitzing *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 43-53 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

Functions and qualities are described of a program system developed to allow a spatial, coherent synthesis and analysis of regional planning data dispersed over several administrations. Generalised networks are used as space modules and are represented by gridlike line structures. Nodes, segments and meshes are represented by attributes. The system can be used in batch processing as well as interactively. The high flexibility as regards usage, net type selection, updating, and in- and output capabilities are stressed. Author (ESA)

N81-33532# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
BABEK: PORTABLE AND STANDARDIZED BASIC SOFTWARE FOR DECENTRALIZED INFORMATION AND CARTOGRAPHIC SYSTEMS [BABEK: PORTABLE UND NORMGERECHTE BASISSOFTWARE FUER DEZENTRALE BERICHTS- UND KARTIERSYSTEME] **c82**
Manfred Linder *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 55-64 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

The development is discussed of independent basic software for an interactive graphical terminal based on a 16 bit intelligent minicomputer and intended for application in cartography, cadastral surveys and building management, and spatial planning. The basic elements are described: (1) an interactive graphical kernel graphics system; (2) a data management system for geometrical objects and attribute data; (3) portable and adaptable compiler; (4) a main computer link. The practical realization is forthcoming. Author (ESA)

N81-33533# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE APPLICATION OF A GRAPHICAL DATA PROCESSING SYSTEM FOR THE DOCUMENTATION OF UNDERGROUND ELECTRICAL SUPPLY LINES [DER EINSATZ EINES GRAPHISCHEN DATENVERARBEITUNGSSYSTEMS ZUM NACHWEIS UNTERIRDISCHER LEITUNGEN IN DER ELEKTRIZITPETSWIRTSCHAFT] **c33**
Wolfgang Lutz *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 65-76 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

The configuration of a graphical data processing system for the compilation of plans relating to underground supply lines is described. The automated plan preparation is the first step towards the realization of a technical databank concerning the grid facilities. The system configuration, the user programs, and the experience gained over a one year test phase are described. The economical and financial implications are also considered.
Author (ESA)

N81-33534# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DEVELOPMENT OF DIGITAL HEIGHT MODELS FROM CONTOURLINE REPRESENTATIONS [ENTWICKLUNG DIGITALER HOEHENMODELLE AUS HOEHENLINIENDARSTELLUNGEN] **c43**
Kurt Menke *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 77-94 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

Various procedures used for the calculation of digital height models from digitized contourlines are reviewed. From such height models contour, profile and block diagrams can be derived and mass and visibility computations carried out. The gliding surface method, the interpolation using the least squares method, the multiquadratic method, and the interpolation starting from linear finite elements are discussed and their properties compared with those of directly measured height models. It is concluded that in all cases additional field measurements are needed when the distance between contourlines becomes large and that an increase of the number of data points beyoud a case dependent optimum can lead to an increase of interpolation errors.

Author (ESA)

N81-33535# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE FIRST NAUTICAL CHARTS PRODUCED BY THE GERMAN HYDROGRAPHIC INSTITUTE BY MEANS OF AUTOMATIC DATA PROCESSING [DIE ERSTEN IM DEUTSCHEN HYDROGRAPHISCHEN INSTITUT MIT ADV-UNTERSTUETZUNG ERSTELLTEN SEEKARTEN] c43

Karl-Wilhelm Schrick *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 95-99 ref In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

The experience gained during the production of three nautical charts, covering an area of the NW coast of France, whereby for the first time use was made of automatic data processing is discussed. The interactive graphical system, the digitizing techniques, and the imaging methods are described as well as the generalization and presentation of the particular maps. Production time and working conditions at the graphical terminal are assessed. Author (ESA)

N81-33536# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE TOPOGRAPHICAL DATA BASE SYSTEM TOPSY [DAS TOPOGRAPHISCHE DATENBANKSYSTEM TOPSY] c43

Wilfried Staufenbiel *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 101-110 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

A description is given of the experience gained during the conception and utilization of a topographic data base system developed for processing and representation of photogrammetrically acquired digital altimetric information. Conception, management functions, data base structure, and data flow are discussed and possible improvements indicated. The production of contourline originals of the German Basic Map 1 : 5000, of which about 100 sheets are annually compiled, demonstrates the capabilities of the systems. Author (ESA)

N81-33537# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

NEW WAYS OF COMMUNICATION IN GEOSCIENCES BY MEANS OF AUTOMATIC DATA PROCESSING [NEUE KOMMUNIKATIONSWEGE IN DEN GEOWISSENSCHAFTEN MIT HILFE DER AUTOMATISCHEN DATENVERARBEITUNG] c60

Renier Vinken *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 110-124 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

The exploitation of the present capabilities of automatic data processing towards construction of geological, pedological, and geomorphological maps at the scale of 1 : 25,000 is projected. The proposal comprises three main aspects : (1) computer aided map construction starting from terrain and laboratory data; (2) computer aided evaluation of conventionally constructed maps for the compilation of practice-oriented evaluation maps; (3) promotion of training in automatic data processing. The collaboration of universities, geological surveys and forest planning offices over a five year period is foreseen. Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N81-33538 International Institute for Applied Systems Analysis, Laxenburg (Austria).

[SYSTEMS ANALYSIS AND WORLD RESOURCES] Annual Report, 1980

H. J. Miser, ed. and D. Delves, ed. 1981 87 p refs

Avail: Issuing Activity

Research on energy systems and on food and agriculture programs is outlined. Progress in the resources and environment, human settlements and services, management and technology, system and decision sciences, general research, and education areas was reviewed. The conclusions of a seven year study of the global energy problem are presented. Optimization research, including large scale structured linear programming and stochastic optimization was conducted. Global and regional economic modelling efforts are described. Author (ESA)

N81-33539*# Environmental Research and Technology, Inc., Concord, Mass.

COMPARATIVE ANALYSIS OF SEA ICE FEATURES USING SIDE-LOOKING AIRBORNE RADAR (SLAR) AND LANDSAT IMAGERY Final Report

James C. Barnes and Clinton J. Bowley, Principal Investigators Cleveland NASA. Lewis Research Center Mar. 1981 71 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract NAS3-21924)

(E81-10044; NASA-CR-165335; P-3970-F) Avail: NTIS HC A04/MF A01 CSCL 08L

A comparative analysis of sea ice features was carried out using X-Band, real aperture side-looking airborne radar (SLAR) and LANDSAT imagery. The SLAR data were collected by the NASA/LeRC C-131 aircraft on flights over the Mackenzie Delta and Prudhoe-Barrow areas of the southern Beaufort Sea and the Norton Sound area of the eastern Bering Sea. The LANDSAT data were for dates as near as possible to the dates of the SLAR missions. The analysis of the data sample available for the investigation indicates the SLAR imagery has distinct advantages over LANDSAT for identifying certain features and ice types. It is further indicated that the capability for SLAR observe ice through clouds is essential for an operational ice information system. R.C.T.

N81-33540*# EG & G Washington Analytical Services Center, Inc., Riverdale, Md. Applied Systems Dept.

A STUDY OF THE EFFECTS OF THE ATMOSPHERE ON THEMATIC MAPPER OBSERVATIONS

William A. Pearce, Principal Investigator 1 Oct. 1977 139 p refs ERTS

(Contract NAS5-23639)

(E81-10056; NASA-CR-166660; EGG-004-77) Avail: NTIS HC A07/MF A01 CSCL 08B

The impact of Rayleigh and aerosol light scattering and the scattering of light by the ground both within and beyond the instantaneous field of view of the sensor are included in a Monte Carlo computer code used to simulate the transport of radiation from its source (the Sun) to satellite-borne receivers. The problem of signature contamination by atmospheric scattering is addressed. The specifications of the details of the computer code and of the model for the atmosphere-Earth-receiver system are described. Specifications of the thematic mapper scheduled to be launched on LANDSAT-D are summarized. Model observations of ground patterns and calibration effects are discussed. General formalism, spread and modulation transfer functions, and image enhancement are considered. The impact of the atmosphere on classification and classification errors is examined. Recommendations are included. A.R.H.

N81-33541*# Washington Univ., Seattle. Dept. of Geological Sciences.

COMPARISON OF LABORATORY REFLECTANCE SPECTRA AND LANDSAT MULTISPECTRAL IMAGES OF HAWAIIAN LAVA FLOWS

Diane L. Evans, Tom G. Farr, and John B. Adams, Principal Investigators 1981 34 p refs Submitted for publication Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E81-10061; NASA-CR-164748) Avail: NTIS HC A03/MF A01 CSCL 08K

Laboratory reflectance spectra of samples with known compositions were compared to LANDSAT multispectral image of Hawaii. The technique used involves determining what the spectral response of a material of interest is at different wavelengths based on laboratory measurements, and searching a stack of spatially registered multispectral images for picture elements with the desired spectral signature. A relatively simple atmospheric correction was employed that combined the effects of gaseous absorption, Rayleigh, and anisotropic aerosol scattering. Laboratory spectal reflectance measurements of surface samples from Hawaii were found to allow mapping of a similar material over many square kilometers in the Hawaii LANDSAT frame, and that correspondence with the known geology and vegetation is excellent. The technique can be generalized to incorporate any bandpasses, and, therefore, has potential for identifying and mapping rock and vegetation types remotely. A.R.H.

N81-33542*# Texas A&M Univ., College Station. Remote Sensing Center.

DRYLAND PASTURE AND CROP CONDITIONS AS SEEN BY HCMM Progress Report, Jan. - Apr. 1980

J. C. Harlan, Principal Investigator, W. D. Rosenthal, and Bruce J. Blanchard Apr. 1980 19 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(Contract NAS5-24383)

(E81-10080; NASA-CR-164749; PR-3712-9) Avail: NTIS HC A02/MF A01 CSCL 02C

Daily antecedant precipitation indexes (API) values were calculated from precipitation amounts at each rain gage on the Washita River watershed; daytime thermal IR data from the watershed on July 24 was compared to July 13 daytime IR data covering the same area. Surface moisture conditions on the 13th were drier. A good relationship is apparent between thermal temperature difference around each rain gage site and the corresponding API value on July 24, 1978. Thirty-six hour day/night registered IR data at each rain gage on October 16/17 was compared to the corresponding daily API. Thermal patterns associated with an October 8 storm were still detectable but not as strongly as day/day differences between July 24 and 13. Analysis began on the IR data from the 10 HCMM CCT's tapes, received as well as on GOES visible and IR data for July 21 and 28, 1978. The spatial and thermal resolution in the latter were too gross to detect minor soil moisture differences which were detectable during the same period on HCMM thermal data. A.R.H.

N81-33543*# Dartmouth Coll., Hanover, N.H.

AN INVESTIGATION OF VEGETATION AND OTHER EARTH RESOURCE/FEATURE PARAMETERS USING LANDSAT AND OTHER REMOTE SENSING DATA. 1: LANDSAT. 2: REMOTE SENSING OF VOLCANIC EMISSIONS Semiannual Status Report, 1 Feb. - 31 Jul. 1981

Richard W. Birnie and Richard E. Stoiber, Principal Investigators 31 Jul. 1981 44 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract NCC5-22)

(E81-10081; NASA-CR-164750; SASR-3) Avail: NTIS HC A03/MF A01 CSCL 08F

The application of a classification algorithm for mixture landscapes to LANDSAT data in order to inventory one-half million acres of forest land in northern Maine is reported as well as efforts to develop a user-oriented mapping system for forestry applications. Ash samples and ash leachates from volcanoes around the world were cataloged and analyzed. An instrument developed for remotely sensing HCl gas is being calibrated and evaluated. A real-time computer line for the COSPEC is under investigation in order to facilitate analysis of SO2 emission at a more detailed level than possible before. Evidence of increased magmatic gas component from Mt. St. Helens is documented and volcanic activity in Nicaragua is summarized. A.R.H.

N81-33544*# North Carolina State Univ., Raleigh. School of Engineering.

THE USE OF CHARGE TRANSFER DEVICES FOR LANDSAT PATTERN CLASSIFICATION Final Report

[1981] 23 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E81-10087; NASA-CR-164751) Avail: NTIS HC A02/MF A01 CSCL 05B

Several techniques were developed and tested for increasing the performance of analog or analog/binary systems which perform calculations of Gaussian pattern classification of multispectral data. All the techniques involve scaling of data parameters. The two major sources of inaccuracies in the system are random noise and unpredictable shifts in the zero point. Input scaling, covariance scaling, and x-u scaling are discussed. Application of the these techniques with the prototype system developed resulted in successful classification of land and water with zero errors. A.R.H.

N81-33545*# Texas A&M Univ., College Station. Remote Sensing Center.

MEASUREMENT OF SOIL MOISTURE TRENDS WITH AIRBORNE SCATTEROMETERS Progress Report, 1 Jan. 1980 - Jan. 1981

M. J. McFarland, Cheryl Jones, Sidney W. Theis, and Wesley D. Rosenthal, Principal Investigators 1 Jan. 1981 49 p ERTS (Grant NsG-5134)

(E81-10078; NASA-CR-164752; RSC-3458-5) Avail: NTIS HC A03/MF A01 CSCL 08M

Soil moisture data collected in conjunction with aircraft data approximately 4 miles northwest of Dalhart, Texas are summarized. Ground data were collected in 22 fields extending along two parallel 11-mile lines running east-west. The sample fields included corn, pasture, millet and fallow fields selected for their suitability for analysis with aircraft data. A NASA C130 flew every other day along the two flight lines. Two passes were flown on each line with various sensors operating on each pass. The sensor included a PRT-5, NS001 thematic mapper, MMS, L and C band passive microwave radiometers and 13.3, 4.75, 1.6 and .4 GHz scatterometers. In addition, low and medium altitude color infrared photography and special calibration data were gathered. The ground work, the fields, procedures in the field and lab, and the final data sets are described. A.R.H.

N81-33546*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

INTERIM CATALOG GROUND DATA SUMMARY, DATA ACQUISITION YEAR 1978

V. L. Cook and H. M. Doyle, Principal Investigators Mar. 1981 37 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E81-10132; NASA-CR-161035; MU-L1-04056; LEMSCO-16325; JSC-17120) Avail: NTIS HC A03/MF A01 CSCL 02C

Those sample segment number for which aircraft data were acquired and/or field inventory data were produced in 1978 are listed by states. Detail specifications, background information, description of the format, sources of information, and an explanation of procedures for the catalog are included. A.R.H.

N81-33547*# Vermont Univ., Burlington. School of Natural Resources.

THE DEVELOPMENT OF A REMOTE SENSING APPLICATIONS PROGRAM FOR VERMONT Annual Summary Report, 1 Jun. 1980 - 31 May 1981

Roy A. Whitmore, Jr., Principal Investigator 31 May 1981 59 p Original contains color imagery. Original photography

may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Grant NsG-7453)
(E81-10149; NASA-CR-164871) Avail: NTIS HC A04/MF A01 CSCL 08F

Ancillary hardware was obtained to expedite computer processing of remotely sensed data and demonstrations were held to acquaint general and technical interest groups with the facilities and service available. Systems were developed for handling and analyzing data. A Vermont land cover classification scheme and a remote sensing inventory and information system were devised. Specific applications discussed included (1) detecting forest insect defoliation; (2) Brighton land cover/land use mapping or planning; (3) Morristown farmland inventory and agricultural land study; (4) site analysis for a proposed wood-fired electric power plant; and (5) LANDSAT hands-on training course for State of New Hampshire personnel. The acquisition and testing of equipment for small-format aerial photography is also reported. A.R.H.

N81-33548*# College of William and Mary, Williamsburg, Va. Dept. of Geology.
MINERALOGICAL, OPTICAL, AND GEOCHEMICAL PROPERTIES OF JOHN H. KERR RESERVOIR SEDIMENT SAMPLES FOR AgRISTARS POLLUTION RESEARCH
Karen L. Bice and Stephen C. Clement, Principal Investigators Aug. 1981 18 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS1-16042; Proj. AgRISTARS)
(E81-10155; NASA-CR-165762) Avail: NTIS HC A02/MF A01 CSCL 08F

X-ray diffraction and spectroscopy were used to investigate and compare the mineralogical and chemical properties of two Kerr Reservoirs sediment samples. The index of refractions of the kaolinite present in each sample was determined also. The sediments are composed primarily of illite, kaolinite, quartz, and minor amounts of chlorite. The most abundant elements in the sediment samples are silicon, aluminum, and iron. The kaolinite of sample K-10-80 has a higher index of refraction than that of sample K-3-81. Author

N81-33549*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A COMPARATIVE STUDY OF THE THEMATIC MAPPER AND LANDSAT SPECTRAL BANDS FROM FIELD MEASUREMENT DATA
G. D. Badhwar and K. E. Henderson, Principal Investigators Mar. 1981 21 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E81-10165; NASA-TM-84032; SR-J0-04029; JSC-16849) Avail: NTIS HC A02/MF A01 CSCL 02C

Principal component and factor analysis techniques were applied to the spectral data collected over 27 field plots of various crops under varying agronomic conditions. The spectral data was integrated over the proposed thematic mapper bands and LANDSAT MSS spectral bands. The results were examined to compare the discrimination power of the thematic mapper. Author

N81-33550*# Minnesota Univ., Minneapolis. Space Science Center.
A STUDY OF MINNESOTA LAND AND WATER RESOURCES USING REMOTE SENSING, VOLUME 14 Progress Report, 31 Dec. 1980
1 Jan. 1981 97 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Grant NGL-24-005-263)
(E81-10166; NASA-CR-164768) Avail: NTIS HC A05/MF A01 CSCL 05B

Techniques developed for processing and interpreting imagery and for correlating data obtained in the field as well as by aerial and satellite photography are described with particular emphasis on monitoring water quality in lakes, detecting ground water levels, and evaluating moisture stress to plants. For individual titles, see N81-33551 through N81-33554.

N81-33551*# Minnesota Univ., St. Paul. Remote Sensing Lab.
DEVELOPMENT OF ALTERNATIVE DATA ANALYSIS TECHNIQUES FOR IMPROVING THE ACCURACY AND SPECIFICITY OF NATURAL RESOURCE INVENTORIES MADE WITH REMOTE SENSING DATA
Thomas M. Lillesand, Principal Investigator *In its* A Study of Minn. Land and Water Resources Using Remote Sensing, Vol. 14 1 Jan. 1981 14 p ERTS (For primary document see N81-33550 24-43)
Avail: NTIS HC A05/MF A01 CSCL 05B

The applicability of digital LANDSAT data in updating the Minnesota Lake Land Management Information System and in assessing the trophic status of lakes was investigated. Data from various combinations of training, classification, and geometric correction techniques were compared to a photointerpreted reference data set consisting of ground-verified samples and six randomly selected photographs covering approximately one quarter of the study area. For a reconnaissance inventory, the training via polygons selected from aerial photographs with a canonical analysis minimum distance classifier is the most accurate and efficient analysis technique. The applications test project resulted in disappointing thematic classification results per se, but did contribute to the development of mechanisms for implementing a LANDSAT data processing capability in the State Planning Agency on a permanent basis. A.R.H.

N81-33552*# Minnesota Univ., Duluth. Dept. of Physics.
LAKEWIDE MONITORING OF SUSPENDED SOLIDS USING SATELLITE DATA
Michael Sydor, Principal Investigator *In its* A Study of Minn. Land and Water Resources Using Remote Sensing, Vol. 14 1 Jan. 1981 29 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (For primary document see N81-33550 24-43)
Avail: NTIS HC A05/MF A01 CSCL 08H

In anticipation of using LANDSAT and Nimbus 7 coastal zone color scanner data to observe the decrease in suspended solids in Lake Superior following cessation of the dumping of taconite tailings, a series of lakewide sampling cruises was conducted to make radiometric measurements at a lake level. A means for identifying particulates and measuring their concentration from LANDSAT data was developed. The initial distribution of chemical parameters in the extreme western arm of the lake, where the concentration gradients are high, is to be based on the LANDSAT data. Subsequent lakewide dispersal and distribution is to be based on the coastal zone color scanner data. A.R.H.

N81-33553*# Minnesota Univ., St. Paul. Geological Survey.
SYNERGISTIC RELATIONSHIPS AMONG REMOTE-SENSING AND GEOPHYSICAL MEDIA: GEOLOGICAL AND HYDROLOGICAL APPLICATIONS Final Report
David L. Southwick, Joseph E. Goebel, Matt Walton, Lawrence G. Batten, and James Heutmaker, Principal Investigators *In its* A Study of Minn. Land and Water Resources Using Remote Sensing, Vol. 14 1 Jan. 1981 29 p ref ERTS (For primary document see N81-33550 24-43)
Avail: NTIS HC A05/MF A01 CSCL 08G

Skylab photographs, side-looking radar imagery, published soil maps, topographic maps, conventional aerial photography as well as LANDSAT imagery under wet and dry changes for several years were analyzed over selected areas in Minnesota to test their usefulness in detecting near-surface ground water. Results show that optical density read from LANDSAT data is not a reliable discriminator of depth to shallow ground water when one band of one scene is used alone, and is little improved when several bands of several scenes are used synergistically. The method is enhanced if information from soil maps is included in the analysis, especially for discriminating boggy ground from better drained areas. It appears, however, that in areas where soil maps and good topographic maps already exist, the depth to ground water can be predicted from those media as well as (if not better than) it can be predicted from remote imagery.

The LANDSAT method used demonstrated no capability for recognizing deeper categories of ground water. A.R.H.

N81-33554*# Minnesota Univ., St. Paul. Dept. of Soil Science.

A PROJECT TO EVALUATE MOISTURE STRESS AND PHENOLOGICAL FACTORS IN CORN AND SOYBEAN AREAS OF SOUTHWESTERN AND SOUTH-CENTRAL MINNESOTA

R. H. Rust and Pierre Robert, Principal Investigators *In its* A Study of Minn. Land and Water Resources Using Remote Sensing, Vol. 14 1 Jan. 1981 18 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Souix Falls, S.D. 57198. ERTS (For primary document see N81-33550 24-43)

Avail: NTIS HC A05/MF A01 CSCL 02C

The capability of aerial color infrared photography for identifying and locating soilscapes most susceptible to drought development or those having different soil drainages was evaluated. Although west central and southwestern Minnesota had a significant precipitation deficit during the 1980 crop season, indications of plant stress were not observed either from ground observation or through interpretation of imagery at the selected sampling sites. Well-drained soil was more depleted during the 'maximium green peak' period than the poorly drained soil. The recharge was more evident on the poorly drained site in the fall. Measurements of leaf water potential and leaf temperature for corn and soybean leaves were made by multispectral band scanner and recorded for analysis. A.R.H.

N81-33555*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

AgRISTARS: FOREIGN COMMODITY PRODUCTION FORECASTING. PROGRAM REVIEW PRESENTATION TO LEVEL 1, INTERAGENCY COORDINATION COMMITTEE Semiannual Project Management Report

Roy Eason, Principal Investigator 6 Nov. 1980 123 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Proj. AgRISTARS)

(E81-10168; NASA-TM-84030; FC-J0-04010; JSC-16835) Avail: NTIS HC A06/MF A01 CSCL 02C

Accomplishments made since March 1980 in developing and testing procedures to provide more objective and reliable crop production forecasts several times during the growing season as well as improved preharvest estimates for a range of countries and crops are summarized. Results of classification procedures verification and simulated aggregation tests are included as well as evaluations of crop stage model performance. The status of wheat/barley and corn/soybean experiments is examined and the extension of the methods used in the experiments to multicrop sampling and aggregation is considered. The foreign similarity region approach, objectives and scopes for FY-81, and major changes in the FY81/82 plan are examined. A.R.H.

N81-33556*# Science and Education Administration, Weslaco, Tex.

METHODS OF EDITING CLOUD AND ATMOSPHERIC LAYER AFFECTED PIXELS FROM SATELLITE DATA Quarterly Progress Report, 5 Dec. 1980 - 5 Jun. 1981

Paul R. Nixon, Craig L. Wiegand, Arthur J. Richardson, Michael P. Johnson, and Benjamin G. Goodier, Principal Investigators Jun. 1981 12 p ref ERTS

(NASA Order S-75406-B)

(E81-10169; NASA-CR-164769; QR-1; QR-2) Avail: NTIS HC A02/MF A01 CSCL 05B

Removal of such pixels prior to interpretation would avoid erroneous conclusions about Earth surface conditions such as extent and severity of, for example, droughts and freezes and their probable economic impact due to crop losses. The results of a cluster screening procedure applicable to daytime satellite coverage when reflective (VIS) and emissive (IR) band data are obtained were examined. For a 3 Jul 78 HCMM daytime scene, twenty-eight VIS digital values each accounted for over 1.0% of the pixels in the south Texas test area. The VIS digital value of 42, associated with land features, exceeded all others in frequency of occurrence, accounting for 5.6% of all pixels in the daytime scene. The most common IR digital count value was 80 which was common to both land and water. It accounted for 2.6% of the pixels. T.M.

N81-33557*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.

AN EVALUATION OF MSS P-FORMAT DATA REGISTRATION

Marcellus H. Graham and Raymond C. Luebbe, Principal Investigators Apr. 1981 57 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Dept. of Agriculture, Washington, D.C. ERTS

(Proj. AgRISTARS)

(E81-10171; NASA-TM-84033; DC-Y1-04069; NSTL/ERL-197) Avail: NTIS HC A04/MF A01 CSCL 02C

Twelve LANDSAT scenes of the P-format were analyzed for registration accuracy based on the hotline oblique mercator (HOM) tick marks contained in the annotation record. Independently chosen ground control points were used to evaluate each scene. The results indicate that 8 out of the 12 showed either good or fairly good registration and that the registration information provided with the MSS data can be used as a starting point from which to make a more precise registration. Author

N81-33558*# Kansas Univ., Lawrence. Space Technology Center.

CROP PHENOLOGY AND LANDSAT-BASED IRRIGATED LANDS INVENTORY IN THE HIGH PLAINS: APPENDICES Final Report

[1981] 201 p refs ERTS

(Grant NAG2-57)

(E81-10172; NASA-CR-164565) Avail: NTIS HC A10/MF A01 CSCL 02C

Data collected in an effort to produce a master crop calendar in map and tabular format for the High Plains Aquifer are presented. Contents include: a key to the counties in the High Plains Aquifer; USDA Economics and Statistic Service data for 1979; Agricultural Stabilization and Conservation Service data for 1979 and 1980; Cooperative Extension Service data for 1979 and 1980; recording methods from questionnaire; scatterplots portraying ASCS, Extension and ESS data; crop irrigation maps; and weekly summary based optimal LANDSAT dates. A bibliography is included. A.R.H.

N81-33559*# Kansas Univ., Lawrence. Space Technology Center.

CROP PHENOLOGY AND LANDSAT-BASED IRRIGATED LANDS INVENTORY IN THE HIGH PLAINS Final Report

E. A. Martinko, Principal Investigator, J. Poracsky, E. R. Kipp, H. Krieger, and K. Gunn [1981] 139 p ERTS

(Grant NAG2-57)

(E81-10173; NASA-CR-164566) Avail: NTIS HC A07/MF A01 CSCL 02C

The need to determine the volume of ground water being pumped from the High Plains region aquifer (HPRA) for irrigation can be met using a LANDSAT based remote sensing system. Crop calendar differences in such a large area (most of Nebraska, half of Kansas, the Texas and Oklahoma Panhandle areas, a portion of South Dakota, and the eastern parts of Wyoming, Colorado, and New Mexico) can introduce local influences on the interpretation of the algorithms employed. A method is described for determining the optimal dates for inventorying various crops grown on these irrigated lands in support of an effort to identify irrigated and develop a computer model for predicting aquifer response to changes in ground water development. A crop calendar for the crops grown in the HPRA is presented. A.R.H.

N81-33560*# Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.

CORNELL UNIVERSITY REMOTE SENSING PROGRAM Semiannual Status Report, 1 Dec. 1980 - 31 May 1981

Warren R. Philipson, Principal Investigator, Ta Liang, and John A. Stanturf Jun. 1981 115 p refs ERTS

(Grant NGL-33-010-171)

(E81-10174; NASA-CR-164567; SASR-18) Avail: NTIS

HC A06/MF A01 CSCL 05B

A preliminary methodology was developed for siting windmills and selecting test sites for locating anemometers in Erie, Niagra, and Orleans Counties, New York. Overlays were derived fom historic airphotos (1938-1968) of the Love Canal area in an effort to show changes and delineate drainage areas. Projects in progress include assessing scenic views in Hamilton County, New York; developing algorithms for predicting vineyard yield; and a study of the spectral effects of sulfur dioxide on bean yield. Spin-off research includes developing a remote sensing method for improving lake sampling strategies, using digital analysis of LANDSAT data to characterize acid lakes; and studying advanced technologies for environment management and monitoring. A.R.H.

N81-33561*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

EVALUATION OF LANDSAT DATA ANALYSIS FOR FOREST SURVEY Final Report

R. P. Mroczynski, R. M. Hoffer, and R. F. Nelson, Principal Investigators 1980 47 p refs Sponsored by NASA and US Forest Service Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E81-10175; NASA-CR-164754; LARS-TR-101880) Avail: NTIS HC A03/MF A01 CSCL 02F

LANDSAT classification results are compared to current survey statistics for forest/non-forest classes in the northeastern aspen-birch survey unit in Minnesota. The results help to provide: the first step in a land change monitoring system; estimates of cost of local and regional land use statistics obtained from LANDSAT; and information regarding the degree of information that can be extracted from LANDSAT. The possibility of detecting disturbance on survey plots was determined. The possible application of forest survey ground plots as training material for computer-aided LANDSAT classification is discussed. T.M.

N81-33562*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION OF THE AUTOMATIC REGISTRATION SYSTEM FOR THE CARTOGRAPHIC TECHNOLOGY LABORATORY

N. Y. Chu and R. L. Nugent, Principal Investigators Dec. 1980 224 p ERTS

(Contract NAS9-15800)

(E81-10176; NASA-CR-160961; LEMSCO-15904; JSC-17017) Avail: NTIS HC A10/MF A01 CSCL 08B

The function of each processor comprising the automatic registration system is described. This document is intended to be used concurrently with the automatic registration system manual. The system is designed to be used on the PDP 11/45 computer. A.R.H.

N81-33563*# Elogic, Inc., Houston, Tex.

MAXIMUM LIKELIHOOD LABELING

M. E. Rassbach, Principal Investigator Feb. 1981 21 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development ERTS

(Contract NAS9-15981; Proj. AgRISTARS)

(E81-10177; NASA-CR-160948; SR-X1-04041; NAS-811) Avail: NTIS HC A02/MF A01 CSCL 12A

A method of identifying or labeling the cluster produced by any clustering algorithm has been designed and developed. This associates an externally defined label with each cluster, using a few prelabelled input points. Author

N81-33564*# Tulsa Univ., Okla. Div. of Mathematical Sciences.

MAXIMUM LIKELIHOOD ESTIMATION FOR MIXTURE MODELS

R. A. Redner, Principal Investigator Oct. 1980 51 p refs Sponsored by NAsA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development Prepared in cooperation with Lockhead Engineering and Management Services Co., Inc., Houston, Tex. ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E81-10178; NASA-CR-160967; SR-J0-04007; LEMSCO-14880; JSC-16832) Avail: NTIS HC A04/MF A01 CSCL 12A

The maximum likelihood estimation of parameters in mixture model is discussed, the use of ancillary information in the maximum likelihood process is shown, and the strong consistency of the maximum likelihood estimator is proven. A study of these three areas leads to a threshold maximum estimator which estimates the number of classes in a mixture model. This estimator, along with the iteration procedure by which it is calculated, is described. Local and global results for the procedure are given. A.R.H.

N81-33565*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AUSTRALIAN TRANSITION YEAR SPECIAL STUDIES

R. W. Payne and T. E. Armstrong, Principal Investigators Jan. 1981 110 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E81-10179; NASA-CR-160968; FC-L0-00464; LEMSCO-14808; JSC-16368) Avail: NTIS HC A06/MF A01 CSCL 02C

The processing of Australian data during LACIE transition year resulted in identification of the major issues in classification, sampling/aggregation, yield, and production. Classification issues which were identified and/or partially resolved are those concerned with early-season and late-season wheat varieties, abandonment, confusion crops, and ancillary data problems, especially crop calendar problems. Labeling accuracy results and ground-truth data from a New South Wales sample segment are included with results, conclusions, and recommendations for crop labeling and labeling-related issues. A.R.H.

N81-33566*# Science and Education Administration, Phoenix, Ariz. Water Conservation Lab.

CANOPY TEMPERATURE AS A CROP WATER STRESS INDICATOR

R. D. Jackson, S. B. Idso, R. J Reginato, and P. J. Pinter, Jr., Principal Investigators Mar. 1981 32 p refs Submitted for publication Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development ERTS

(Proj. AgRISTARS)

(E81-10180; NASA-CR-160981; EW-U1-04077; JSC-17133) Avail: NTIS HC A03/MF A01 CSCL 02C

Canopy temperatures, obtained infrared thermometry, along with wet- and dry-bulb air temperatures and an estimate of net radiation were used in equations derived from energy balance considerations to calculate a crop water stress index (CWSI). Theoretical limits were developed for the canopy-air temperature difference as related to the air vapor pressure deficit. The CWSI was shown to be equal to 1 - E/E sub p, the ratio of actual to potential evapotranspiration obtained from the Penman-Monteith equation. Four experimental plots, planted to wheat, received post-emergence irrigations at different times to create different degrees of water stress. Pertinent variables were measured between 1340 and 1400 each day (except some weekends). The CWSI, plotted as a function of time, closely paralleled a plot of the extractable soil water in the 0-to 1.1-m zone. Usefulness and limitations of the index are discussed. Author

N81-33567*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

WEIGHTED RATIO ESTIMATION OF LARGE AREA CROP PRODUCTION

Alan H. Feiveson, Principal Investigator Feb. 1981 41 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency of International Development ERTS

(Proj. AgRISTARS)

(E81-10187; NASA-TM-84031; SR-J1-04036; JSC-16861) Avail: NTIS HC A03/MF A01 CSCL 20C

A framework is presented in which the estimates of a stratum crop acreage can be obtained either by using direct measurements on sampling units within the stratum, or by ratioing to the estimate of some other stratum (or group of strata) using a concomitant

variable whose values are known at the stratum level. If strata are collections of political subdivisions for which historical data exists, then the latter, aggregated to the stratum level, provides a useful variable on which to ratio. The first method is unbiased if measurement errors are unbiased; the second procedure is only unbiased if concomitant variables in proportional to the target variable over strata. In general, some weighted average of the two types of estimates will procedure the smallest mean-squared error at the stratum level. A model is developed which represents current year stratum crop acreages as deviations from an expectation which is proportional to the previous year's stratum acreages. It is shown how optimal large area acreage and production estimates may be obtained with this model. A.R.H.

N81-33568*# College of William and Mary, Williamsburg, Va. Dept. of Geology.

MINERALOGICAL, OPTICAL, AND GEOCHEMICAL PROPERTIES OF JOHN H. KERR RESERVOIR AND LAKE CHICOT SEDIMENT SAMPLES FOR AgRISTARS POLLUTION RESEARCH

Karen L. Bice and Stephen C. Clement, Principal Investigators Aug. 1981 17 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS1-16042; Proj. AgRISTARS)

(E81-10188; NASA-CR-165761) Avail: NTIS HC A02/MF A01 CSCL 08B

Sediments collected from the Kerr Reservoirs and Lake Chicot are composed primarily of illite, kaolinite, and quartz. Minor amounts of chlorite are present in both sediments. The finer particle size fractions contain greater amounts of kaolinite and lesser amounts of quartz in both sediments. In the Kerr Reservoir sediment, illite shows an overall decrease with decreasing particle size while the Chicot samples increase in illite content. Both the Kerr and Chicot sediments contain high amounts of silicon, aluminum, and iron. The kaolinite of the Kerr Reservoir sediment has a higher index of refraction than that of the Lake Chicot sediment. A.R.H.

N81-33569*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RESEARCH FOR RELIABLE QUANTIFICATION OF WATER SEDIMENT CONCENTRATIONS FROM MULTISPECTRAL SCANNER REMOTE SENSING DATA Interim Report

Charles H. Whitlock, William G. Witte, Theodore A. Taly, W. Douglas Morris, Jimmy W. Usry, and Lamont R. Poole, Principal Investigator May 1981 22 p refs Presented at the Intern. Symp. of Rainfall Runoff Modeling, Mississippi State Univ., Miss., 18-21 May 1981 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS

(Proj. AgRISTARS)

(E81-10194; NASA-TM-82372; CP-Z1-04078; JSC-17134) Avail: NTIS HC A02/MF A01 CSCL 08H

The assessment of conservation practice through remote monitoring of sediment concentration in drainage basin waters is considered. The problem of large sediment concentrations is discussed, laboratory spectral signature results are presented, remote sensing penetration depth knowledge is assessed, and research aimed at quantifying atmospheric transmission, specular reflection and research aimed at quantifying atmospheric transmission, specular reflection, and path radiance is described. The results are expected to be improved experimental techniques and more reliable data analysis procedures for quantification of water sediment concentrations in future years. Such data should be useful in validating rain-full-runoff models of large drainage basins. A.R.H.

N81-33570*# Michigan State Univ., East Lansing. Center for Remote Sensing.

USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION Annual Progress Report, 1 Jun. 1979 - 31 May 1980

31 May 1980 109 p Sponsored in part by Detroit Edison Power Co. and Michigan State Public Services Commisson ERTS

(Grant NGL-23-004-083)

(E81-10195; NASA-CR-164868) Avail: NTIS HC A06/MF A01 CSCL 02C

Progress is reported in (1) identifying hazardous waste disposal sites; (2) assessing damage to corps; (3) analyzing LANDSAT data for updating forest inventories; (4) evaluating LANDSAT data for estimating acreage of small forested areas; (5) assessing stress in the Detroit/Wayne Country River corridor; and (6) basing decisions of pipeline routing decisions on LANDSAT data. Contractual services described include inventorying sand dunes, sand mining sites, farmlands, and wildlife habitats, as well as identifying land resources for the Chippewa Indians. The development of a comprehensive resource inventory and evaluation system, bluff regression studies selected areas of Lakes Huron and Superior, and applications of computer mapping systems in forest resource management are also discussed. A.R.H.

N81-33571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HEAT CAPACITY MAPPING MISSION (HCMM) END-OF-LIFE TESTS

Frank Colesanti, Principal Investigator Jan. 1981 57 p refs Prepared by Bendix Field Engineering Corp., Greenbelt, Md. HCMM

(Contract NAS5-25025)

(E81-10196; NASA-TM-82115) Avail: NTIS HC A04/MF A01 CSCL 05B

The spacecraft performance at end-of-life was the same as that observed during most of its life. Previously unoperated components performed properly. The heat capacity mapping radiometer (HCMR) cooler door was operable above -17 C after having not been operated since January 1979. Attempts to crack the orbit adjust system plumbing were unsuccessful because the hydrazine lines could not be frozen in the time allowed. An attempt to unstick the HCMR compensation motor was successful, but the scanning motor appeared to stop running in the process. The battery capacity was 1.1 amp-hour at EOL compared with over 9 amp-hours at the beginning of the mission. Author

N81-33572*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

A SUMMARY OF OBSERVATIONS CONCERNING THE INFORMATION IN THE SPECTRAL-TEMPORAL-ANCILLARY DATA AVAILABLE FOR ESTIMATING GROUND COVER CROP PROPORTIONS

Charles R. Perry, Jr., Principal Investigator (Texas Lutheran Coll., Seguin) Feb. 1981 31 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Proj. AgRISTARS)

(E81-10201; NASA-TM-84047; FC-J0-00486; JSC-16815) Avail: NTIS HC A03/MF A01 CSCL 02C

In agricultural crop acreage surveys based on satellite-acquired data, the derived estimates ultimately depend on a probabilistic classification of small area units into a number of different ground cover classes. The goal is to assign the small area units to crop classes in such a way that the resulting crop proportion estimates are as accurate as possible. The statistical problem is that of assessing the quantity of information which the LANDSAT reflectance measurements supply about the unknown crop proportions, assuming the most efficient utilization of the data. In this report, we provide a summary and a discussion of Fisher information theory and its application to crop proportion estimation using satellite-acquired data. The theoretical results are illustrated with examples based on data from 1978 Large Area Crop Inventory Experiment (LACIE) photointerpreter classifications of small grains segments. These examples indicate that a considerable information loss occurs during the photointerpretation process. Author

N81-33573*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

A CROP MOISTURE STRESS INDEX FOR LARGE AREAS AND ITS APPLICATION IN THE PREDICTION OF SPRING WHEAT PHENOLOGY

P. C. Doraiswamy and D. R. Thompson, Principal Investigtors Mar. 1981 28 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development Prepared in cooperation with Lockheed Engineering

and Management Services Co., Inc., Houston, Tex. ERTS (Contract NAS9-15800; Proj. AgRISTARS)
(E81-10202; NASA-TM-84035; SR-L1-04064; JSC-17121; LEMSCO-16216) Avail: NTIS HC A03/MF A01 CSCL 02C

An agrometeorological crop phenology model for spring wheat is presented which incorporates the photothermal concept suggested by the Robertson crop calendar model for spring grains. This model differs from the Robertson model in that it incorporates a crop moisture stress index as a model parameter. The data used to assess the effects of moisture stress on phenological development were derived from the literature. In certain parts of the model, it is suggested that remotely sensed spectral data may be used as inputs. The model is applicable to large area forecasting and incorporates the influence of soil moisture deficit on phenological development. Model outputs representing a moisture-stressed condition and an adequate moisture condition are discussed for growth observations in North Dakota and Montana. A.R.H.

N81-33574*# Telespazio, S.p.A., Rome (Italy).
SOME METHODS OF MULTITEMPORAL ANALYSIS OF LANDSAT IMAGES RESULTING FROM A STUDY ON VENICE LAGOON
Angelo Zandonella, Principal Investigator 1980 5 p refs Presented at the Intern. Conf. on Image Anal. and Process., Pavia, Italy, Oct. 1980 Sponsored by NASA ERTS
(E81-10205; NASA-CR-164770) Avail: NTIS HC A02/MF A01 CSCL 08H

Two methods of analysis were developed. The first method concerns the multitemporal calibration of LANDSAT images. It consists of a projection, onto a common signals feature space, of images recorded in different time periods. The second method relates to multitemporal analysis of gravity center classes in the same feature space. The results obtained are discussed. T.M.

N81-33575*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT PLAN: ROW AND ROUGHNESS EFFECTS ON DEPENDENCE OF ACTIVE MICROWAVE MEASUREMENTS OF SOIL MOISTURE
J. F. Paris and L. M. Arya, Principal Investigators Oct. 1980 38 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Lockheed Engineering and Management Services Co., Inc., Houston, Tex. ERTS (Proj. AgRISTARS)
(E81-10209; NASA-TM-84048; SM-JO-00613; JSC-16822; LEMSCO-15181) Avail: NTIS HC A03/MF A01 CSCL 08M

To increase understanding of the effects of agricultural tillage practices and aspect angle on the interpretation of active microwave data over bare agricultural fields, an experiment is planned for determining the effects of different combinations of row spacings and heights at L-band, C-band, and Ku-band for viewing angles of 10 deg, 20 deg, 30 deg, 40 deg, and 50 deg and for HH polarization. The objectives give scope, approach, test site description, and data requirements for the experiment. The data is to be gathered at the Prairie View A&M University, Texas test site and at Jornada, New Mexico. A data analysis plan is proposed including error analysis for estimating the modulation function. A.R.H.

N81-33576*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF ACTIVITIES OF THE ADVANCED COAL EXTRACTION SYSTEMS DEFINITION PROJECT, 1979 - 1980
Milton L. Lavin and Lionel Isenberg 1 Aug. 1981 222 p refs (Contract NAS7-100; Contract DE-AI01-76ET-12548)
(NASA-CR-164852; JPL-Pub-81-69; DOE/ET-12548/7) Avail: NTIS HC A10/MF A01 CSCL 08I

During this period effort was devoted to: formulation of system performance goals in the areas of production cost, miner safety, miner health, environmental impact, and coal conservation, survey and in depth assessment of promising technology, and characterization of potential resource targets. Primary system performance goals are to achieve a return on incremental investment of 150% of the value required for a low risk capital improvement project and to reduce deaths and disability injuires per million man-hour by 50%. Although these performance goals were developed to be immediately applicable to the Central Appalachian coal resources, they were also designed to be readily adaptable to other coals by appending a geological description of the new resource. The work done on technology assessment was concerned with the performance of the slurry haulage system. T.M.

N81-33577*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPARISON OF OBSERVED AND ANALYTICALLY DERIVED REMOTE SENSING PENETRATION DEPTHS FOR TURBID WATER
W. Douglas Morris, J. W. Usry, William G. Witte, Charles H. Whitlock, and E. A. Guraus Sep. 1981 23 p refs
(NASA-TM-83176) Avail: NTIS HC A02/MF A01 CSCL 08H

The depth to which sunlight will penetrate in turbid waters was investigated. The tests were conducted in water with a single scattering albedo range, and over a range of solar elevation angles. Two different techniques were used to determine the depth of light penetration. It showed little change in the depth of sunlight penetration with changing solar elevation angle. A comparison of the penetration depths indicates that the best agreement between the two methods was achieved when the quasisingle scattering relationship was not corrected for solar angle. It is concluded that sunlight penetration is dependent on inherent water properties only. E.A.K.

N81-33578# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EVALUATION OF DETAIL IN DYNAMIC VISUAL DISPLAYS M.S. Thesis
Mary A. Smart 1 Dec. 1980 111 p refs
(AD-A103378; AFIT/GCS/EE/80-14) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report has its basis in the Airborne Electronic Terrain Mapping System (AETMS), an aircraft mapping system based on an idea proposed by L.A. Tamburino and developed by the Air Force Avionics Laboratory. A constantly changing background provides the basis for an interesting investigation on the hypothesis that a dynamic background will distract the operator's attention away from important details on the display. The software developed provides an overlay of symbols onto the terrain map generated by the AETMS and is contained in this report. A symbol and color set is suggested for the AETMS. An experiment to determine a master symbol and color set is suggested. The experiment suggests using both simple vector symbols and Fourier transformed symbols to help define the master set.
Author (GRA)

N81-33579# Army Engineer Topographic Labs., Fort Belvoir, Va.
INTERACTIVE DIGITAL CORRELATION TECHNIQUES FOR AUTOMATIC COMPILATION OF ELEVATION DATA
F. Raye Norvelle 27 Feb. 1981 16 p refs
(AD-A103392; ETL-R021) Avail: NTIS HC A02/MF A01 CSCL 09/2

A program using digital correlation techniques has been implemented on the Digital Image Analysis Laboratory (DIAL) to automatically extract elevation type data from stereoscopic pairs of digital images. The DIAL permits the operator to view on a display unit the stereoscopic model and the computed match-point coordinates in 3-D using anaglyphic techniques. The match points are presented as 3-D profiles superimposed over the 3-D terrain model and consequently the operators can observe the compilation process, detect errors as soon as they occur, and interact with the process to prevent the accumulation of error or to tune the parameters as conditions warrant. The program is described in terms of the hardware used, the algorithm, the operating procedures, and an example of a compiled area. Author (GRA)

N81-33580# Army Engineer Topographic Labs., Fort Belvoir, Va.
INERTIAL SURVEY ADJUSTMENT
Mark S. Todd and Thomas O. Tindall 5 Jun. 1981 8 p refs
(AD-A103391; ETL-R022) Avail: NTIS HC A02/MF A01 CSCL 08/5

The paper discusses primarily a least-squares position adjustment for single or multiple (area coverage) inertial traverses. The adjustment technique is developed and presented in detail for a local-level inertial system and summarily generalized for a space-stable inertial system. Application of the method to other inertially derive t geodetic values is discussed. Author (GRA)

N81-33581# Analytic Sciences Corp., Reading, Mass.
MILITARY GEODESY AND GEOSPACE SCIENCE, UNIT ONE
Warren G. Heller and A. Richard LeSchack Feb. 1981 191 p refs
(Contract F19628-77-C-0152; AF Proj. 3204)
(AD-A104038; SCIENTIFIC-5; AFGL-TR-81-0028) Avail: NTIS HC A09/MF A01 CSCL 08/5

Unit One introduces the student to Mapping, Charting, and Geodesy. Basic concepts and principles are presented that will be applied during the remainder of the course. The subjects to be covered include: Earth modeling; Coordinate systems; and Techniques of mapping, charting, and geodesy. All of these areas are part of the science of geodesy, which is defined by the three principal subjects with which it is concerned: The size and shape of the earth; The relative location of points on or near the surface of the earth; and The earth's gravity field. The first two areas are referred to as geometric geodesy; the third is physical geodesy. The geometric and physical (or gravitational) aspects of geodesy are closely related to one another, since the physical surface of the earth does not deviate greatly from an equipotential surface of the gravity field. The material of Unit One is organized into three chapters, each examining geodesy from a different point of view: Geometric geodesy (Chapter Two) -- including material on relevant aspects of cartography and surveying; Physical geodesy (Chapter Three); and Satellite geodesy (Chapter Four) -- emphasizing the unique contributions to geodesy resulting from the use of Earth satellites. GRA

N81-33582# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
REVIEW OF THERMAL PROPERTIES OF SNOW, ICE AND SEA ICE
Yin-Chao Yen Jun. 1981 35 p refs
(DA Proj. 4A1-51101-A-91D)
(AD-A103734; CRREL-81-10) Avail: NTIS HC A03/MF A01 CSCL 08/12

This treatise thoroughly reviews the subjects of density, thermal expansion and compressibility of ice; snow density change attributed to destructive, constructive and melt metamorphism; and the physics of regelation and the effects on penetration rate of both the thermal properties of the wire and stress level. Heat capacity, latent heat of fusion and thermal conductivity of ice and snow over a wide range of temperatures were analyzed with regression techniques. In the case of snow, the effect of density was also evaluated. The contribution of vapor diffusion to heat transfer through snow under both natural and forced convective conditions was assessed. Expressions representing specific and latent heat of sea ice in terms of sea ice salinity and temperature were given. Theoretical models were given that can predict the thermal conductivities of fresh bubbly ice and sea ice in terms of salinity, temperature and fractional air content. Author (GRA)

N81-33583# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
DOPPLER GEODETIC POINT POSITIONING DATA BASE USED AT DMA
Hiram H. Skaggs, Jr. Aug. 1981 17 p refs
(AD-A103215) Avail: NTIS HC A02/MF A01 CSCL 05/8

This is a narrative report dealing with the automation of Doppler Geodetic Point Positioning Data at the Defense Mapping Agency Hydrographic/Topographic Center. The data base files are geared to meet the needs of both the technician and the geodesist for supplying geodetic data to users throughout the world, and performing analysis and evaluation of results generated from the data base. Included is a brief description of format design and the choice of solution. Future programs and applications are also discussed. Author (GRA)

N81-33584# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. CANYON CITY QUADRANGLE (OREGON), VOLUME 2 Final Report
1981 212 p refs Prepared jointly with QEB, Inc.
(Contract DE-AC13-79GJ-01692)
(DE81-028682; GJBX-240-81-V2-(Canyon-City)) Avail: NTIS HC A10/MF A01

Fourteen uranium anomalies are listed and are shown on the uranium anomaly interpretation map. Potassium (%K), equivalent uranium (ppM eU), equivalent thorium (eT), eU/eT, eU/K, eT/K, and magnetic pseudo contour maps are presented. Stacked profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are included. Geologic unit designations are given for each of the 14 uranium anomalies. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation. DOE

N81-33585# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, SALEM QUADRANGLE (OREGON), VOLUME 2 Final Report
1981 126 p refs Prepared in cooperation with QEB, Inc., Lakewood, Colo.
(Contract DE-AC13-79GJ-01692)
(DE81-028681; GJBX-240-81-Vol-2-(Salem)) Avail: NTIS HC A07/MF A01

Five uranium anomalies which meet the minimum statistical requirements are tabulated and are shown on the uranium anomaly interpretation map. Potassium (%K), equivalent uranium (ppM eU), equivalent thorium (eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented. Stacked profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are included. All maps and profiles were prepared on a scale of 1:250,000, but were reduced to 1:500,000 for presentation. Each of the anomalies occurs over the Eocene Tyee and Burpee formation (Teme), a rhythmically banded, feldspathic and micaceous, massive bedded sandstone, and siltstone. Anomalies 1, 2, 3, and 4 are in the northwest corner of the map. Anomalies 2 and 3 are near faults, so may be due to radon leaking from the faults. Anomaly No. 5 is in the southwest corner of the map. DOE

N81-33586# Stanford Univ., Calif. Petroleum Research Inst.
NUMERICAL MODELING OF THERMAL RECOVERY PROCESSES SUPRI-TR-12
M. Soliman, W. E. Brigham, and R. Raghaven Jun. 1981 130 p refs
(Contracts DE-AC03-76ET-12056; E(04-3)-1265)
(DE81-025642; DOE/ET-12056/12) Avail: NTIS HC A07/MF A01

Forward combustion in a simulated laboratory combustion tube was investigated. A mathematical model was developed that includes the thermal, thermodynamic, and hydrodynamic aspects of the process. Oil is assumed to burn directly. A fully implicit scheme is used in a simultaneous technique which seems to be much faster than the Gottfried model. The model yields spatial distributions of pressure and temperature and saturations and concentrations of all important components (oil, water, oxygen, inert gas, and steam). Finally, it gives production rates, cumulative production, and instantaneous and cumulative WORs and GORs. The developed model can also simulate other thermal recovery processes, such as hot water flooding and steam injection. DOE

N81-33587# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
POSSIBLE APPLICATIONS OF COMMUNICATION SATELLITES FOR RESEARCH TASKS IN POLAR REGIONS Final Report
Gerhard Bommas, Erhard Hanka, Jork Haussmann, Walther Klages, Paul Stuerzenhofaecker, and Joachim Thomas Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 245 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-029; ISSN-0170-1339) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41

The possibilities of using communication satellites to estab-

lish beyond-the-horizon communications within Antartica, and between Antartica and the Federal Republic of Germany is examined. Communication is shown to be possible using the following satellites: Marisat for the transmission of speech, telex and data, GOES for the transmission of meteorological data, and TIROS-N for the reception of cloud pictures. The coverage of geostationary satellites is limited to a latitude of approximately 80 deg. Links, south of 80 deg are to be established by means of HF. Line of sight communication up to 50 km is simply established with VHF equipment. Author (ESA)

N81-33588# Battelle Inst., Frankfurt am Main (West Germany). Abt. Laser und Optik.

EXPERIMENTAL INVESTIGATION OF THE PHYSICAL FUNDAMENTALS FOR REMOTE SENSING OF SOIL AND VEGETATION MOISTURE BY ACTIVE INFRARED REFLECTANCE SPECTROSCOPY USING CO2 LASER TECHNIQUE Final Report

Joerg Boscher and Frank Lehman (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung) Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 39 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-037; BF-R-64-028-01; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8.20

The application of active infrared spectroscopy to remote sensing of soil moisture was examined. The reflectance of water and dry and moist soil samples, including selected minerals and natural soils, was measured with the emission lines of the CO2 laser. The reflectance spectra of the samples change in a characteristic way with increasing moisture. Spectral differences of the dry materials are reduced with increasing water content, enabling the use of the ratio of the reflected intensities of two CO2 laser lines to determine the moisture content of surfaces. The airborne remote sensing system (DIALEX) developed for differential absorption spectroscopy of gases can be employed for two channel reflectance spectroscopy. Applications of this moisture sensing method in the fields of mineral deposits prospecting, agriculture and forestry are discussed. Author (ESA)

N81-33589# Geological Survey, Denver, Colo. Federal Center.

TOPOGRAPHIC SLOPE CORRECTION FOR ANALYSIS OF THERMAL INFRARED IMAGES Interim Report

Kenneth Watson Mar. 1981 14 p refs

(Contract NASA Order-S-40256-B)

(PB81-211781; USGS-GD-81-002) Avail: NTIS HC A02/MF A01 CSCL 08B

A simple topographic slope correction was developed using a linearized thermal model and assuming slopes less than about twenty degrees. The correction can be used to analyze individual thermal images or composite products such as temperature difference or thermal inertia. Simple curves are provided for latitudes of 30 and 50 degrees. The form is easily adapted for analysis of HCMM images using the Defense Mapping Agency digital terrain data. GRA

N81-33590# Geological Survey, Tallahassee, Fla.

QUALITY OF SURFACE WATER IN THE SUWANNEE RIVER BASIN, FLORIDA, AUGUST 1968 THROUGH DECEMBER 1977 Final Report

R. W. Hull, J. E. Dysart, and W. B. Mann, IV 1981 105 p refs Prepared jointly with the Suwannee River Authority, Fla., and the Suwannee River Water Management District, Fla.

(PB81-206591; USGS/WRD/WRI-81/043; USGS/WRI-80-110) Avail: NTIS HC A06/MF A01 CSCL 08H

In the 9,950-square mile area of the Suwannee River basin in Florida and Georgia, 17 surface-water stations on 9 streams and several springs were sampled for selected water-quality properties and constituents from August 1968 through December 1977. Analyses from these samples indicate that: (1) the water quality of tributary wetlands controls the water quality of the upper Suwannee River headwater; (2) ground water substantially affects the water quality of the Suwannee River basin streams below these headwaters; (3) the water quality of the Suwannee River, and many of its tributaries, is determined by several factors and is not simply related to discharge; and (4) development in the Suwannee River basin has had observable effects on the quality of surface water. GRA

N81-33591# Geological Survey, Menlo Park, Calif. Water Resources Div.

RESULTS AND EVALUATION OF A PILOT PRIMARY MONITORING NETWORK, SAN FRANCISCO BAY, CALIFORNIA, 1978 Final Report

Wesley L. Bradford and Rick T. Iwatsubo Oct. 1980 122 p refs Prepared in cooperation with California State Water Resouces Control Board, Sacremento

(PB81-207466; USGS/WRD/WRI-81/035; USGS/WRI-80-73) Avail: NTIS HC A06/MF A01 CSCL 08H

A primary monitoring network of 12 stations, with measurements at 1-meter depth intervals appears adequate to observe major changes in ambient water quality in San Francisco Bay. A 1-year study of network operation determined that analysis of the data could demonstrate the major changes in sainity, temperature, and light-attenuation distributions known to occur, based on earlier research, in response to variations of delta inflow and to other physical processes. Observations of eddies at two stations, of the influence of water from a river flooding in the extreme south bay, and of differences in salinity and temperture laterally across the entrance to the south bay are all new but are consistent with existing models. The ph, dissolved oxygen, and light-attenuation measurements, while adequate to observe small-scale vertical variations, are not sufficiently sensitive to detect the effects of phytoplankton blooms. GRA

N81-33592# Kentucky Water Resources Research Inst., Lexington.

MODELING SOIL WATER CONTENTS AND THEIR EFFECTS ON STREAM FLOW IN KENTUCKY Research Report, Apr. 1977 - Mar 1981

Grant W. Thomas, Ronald E. Phillips, David E. Radcliffe, and Scott Shepard Apr. 1981 77 p refs

(Contracts DI-14-34-0001-7038; DI-14-34-0001-8019; DI-14-34-0001-9019; DI-14-34-0001-0119)

(PB81-209231; RR-128; W81-03260; OWRT-A-073-KY(1)) Avail: NTIS HC A05/MF A01 CSCL 08H

Soil water contents of eight important soil series in Kentucky were measured periodically during the summer growing season for 4 years. The soils were divided into three groups according to their behavior: (1) well-drained and never showed excess water above field capacity at any time during the four seasons; (2) perched water tables at times, especially during the early part of the growing season; (3) the Huntington soil which has a permanent water table. The water calculated from the model as deep drainage was used as a measure of increase in streamflow and compared to measured streamflow on three watersheds and four soils. GRA

N81-33593# Hydrocomp, Inc., Mountain View, Calif.

EVALUATION OF REMOTE SENSING DATA FOR INPUT INTO HYDROLOGICAL SIMULATION PROGRAM-FORTRAN (HSPF) Final Report, Mar. 1979 - Jun. 1980

D. D. Franz and S. M. Lieu Jun. 1981 107 p refs

(Contract EPA-68-01-5801)

(PB81-209561; EPA-600/3-81-037) Avail: NTIS HC A06/MF A01 CSCL 08H

The feasibility of using a remotely sensed data base as input into the hydrologic simulation program-FORTRAN was evaluated (HSPF). Data from LANDSAT and conventionally obtained data were used to set up the input parameters of HSPF. Simulations were run to compare the two sets of data. The remotely sensed data performed as least as well as the conventional one when compared with observed data. in addition, it was estimated to offer savings of 30 to 50 percent in the cost of set up and operations. GRA

N81-33594# Ohio River Valley Water Sanitation Commission, Cincinnati.

QUALITY CONTROL ASSURANCE PROGRAM Final Report

Apr. 1981 99 p

(PB81-210320; ORS/QC-81/03) Avail: NTIS HC A05/MF A01 CSCL 08H

The procedures and materials used to insure the standardization and quality control of tests performed by ORSANCO in its monitoring program on the Ohio River are described. GRA

N81-33595# Geological Survey, Albany, N.Y.
WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1980. VOLUME 2: LONG ISLAND Annual Report, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1981 353 p refs Sponsored in part by the State of New York
(PB81-211484; USGS/WRD/HD-80/031-Vol-2) Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1980 water year for New York are presented. Records of stage, discharge, and water quality of streams, stage, contents, and water quality of lakes and reservoirs; water quality of precipitation; and water levels and water quality of ground water wells are given. This volume contains records for water discharge at 17 gaging stations, water quality at 17 gaging stations, 602 wells, and 3 precipitation stations; and water levels at 126 observation wells. Also included are data for 80 low flow partial record stations. GRA

N81-33596# Geological Survey, Iowa City, Iowa.
WATER RESOURCES DATA FOR IOWA, WATER YEAR 1980 Annual Report, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1981 289 p
(PB81-213399; USGS/WRD/HD-81/039) Avail: NTIS HC A13/MF A01 CSCL 08H

The data consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. Discharge records for 117 gaging stations; stage and contents for 7 lakes and reservoirs; water quality for 25 gaging stations; and water levels for 34 observation are presented. Also included are 126 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. GRA

N81-33597# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
RAILROAD ACCIDENT REPORT: HEAD-END COLLISION OF AMTRAK PASSENGER TRAIN NO. 74 AND CONRAIL TRAIN OPSE-7, DOBBS FERRY, NEW YORK, NOVEMBER 7, 1980
28 Apr. 1981 54 p
(PB81-204869; NTSB-RAR-81-4) Avail: NTIS HC A04/MF A01 CSCL 13L

About 4:12 p.m., on November 7, 1980, Conrail freight train OPSE-7 struck the head-end of Amtrak train No. 74 while it was standing on track No. 2 at Dobbs Ferry, New York. The lead locomotive unit of train OPSE-7 overrode and destroyed the operating cab of the power car of train No. 74. Of the estimated 234 persons aboard the trains, 75 passengers and 9 crewmembers were injured. Damage to the equipment was estimated at $915,000. GRA

N81-33598# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
A SELECTED BIBLIOGRAPHY: REMOTE SENSING APPLICATIONS IN WILDLIFE MANAGEMENT
David M. Carneggie, Donald O. Ohlen, and Lawrence R. Pettinger
23 Feb. 1981 24 p
(Contract DI-14-08-0001-16439)
(PB81-215881) Avail: NTIS HC A02/MF A01 CSCL 13B

This bibliography cites 165 selected technical reports, journal articles, and other publications on remote sensing applications for wildlife management. Developments in the use of remotely sensed data for wildlife habitat mapping, habitat inventory, habitat evaluation, and wildlife census are covered. The works cited were published between 1947 and 1979. GRA

N81-33599# Maine Univ., Orono. Land and Water Resources Center.
QUANTIFICATION OF NON-POINT SOURCE SEDIMENTATION THROUGH DENSITOMETRIC ANALYSIS OF COLOR INFRARED AERIAL PHOTOGRAPHY
Terrence J. Keating, Jerry D. Lowry, and Rachel S. Smith Apr. 1981 79 p refs Sponsored by Dept. of Interior
(PB81-209157; W81-03252; OWRT-A-049-ME(2)) Avail: NTIS HC A05/MF A01 CSCL 13B

A method for the detection, quantification, and location of nonpoint pollution sources upon the use of aerial color infrared photography was established. An airborne small format camera system was flown simultaneous to minimal selected ground sampling. This allowed measurement of ground levels of turbidity and suspended solids over relatively large watershed areas. Calibration of monitored rivers was used to assess firm response to given pollutant types; with quantification by densitometry. Suspended solids concentrations from firm density values are estimated. GRA

N81-33600# Geological Survey, Lincoln, Nebr. Water Resources Div.
INVESTIGATION OF ARTIFICIAL RECHARGE OF AQUIFERS IN NEBRASKA Final Report
William F. Lichtler, David I. Stannard, and Edwin Kouma Sep. 1980 123 p refs Prepared jointly with Old West Regional Commission, Billings, Mont., Nebraska Univ.-Lincoln, and Nebraska Natural Resources Commission, Lincoln and Nebraska Natural Resources Commission, Lincoln
(PB81-207094; USGS/WRD/WRI-81/042; USGS/WRI-80-93) Avail: NTIS HC A06/MF A01 CSCL 08H

The technical feasibility of artificially recharging aquifers through wells and by surface spreading was investigated. In the well experiments, about 0.5 billion gallons of water was withdrawn from a well near the Platte River and recharged through a well into a Pleistocene sand and gravel aquifer near Aurora where ground-water levels are declining. The recharge rate was about 740 gallons per minute during two tests of 6 and 8 months duration. Infiltration rates from surface-spreading experiments ranged from 0.5 feet per day in loess-covered plain to 11 feet per day in sandhills. Perching layers of low permeability existed at each site and could cause problems in recharging. GRA

N81-33349# Centre National de la Recherche Scientifique, Toulouse (France). Centre d'Etude Spatiale des Rayonnements.
SCATTEROMETER MEASUREMENTS ON CROP AND SOIL SURFACES
Thuy LeToan *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 99-110 refs (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33351# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SCATTEROMETER CALIBRATION AND DATA CORRECTION
Richard K. Moore *In* ESA Coherent and Incoherent Radar Scattering from Rough Surfaces and Vegetated Areas May 1981 p 149-163 (For primary document see N81-33339 24-31)
Avail: NTIS HC A08/MF A01

N81-33522# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
POSITION MEASUREMENTS IN COLOMBIA BY MEANS OF SATELLITE OBSERVATIONS [POSITIONSBESTIMMUNGEN IN KOLUMBIEN MITTELS SATELLITENBEOBACHTUNGEN]
Walter Etling *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 5-11 In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

N81-33523# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATED VOICE RECOGNITION IN COMPUTER AIDED CARTOGRAPHY [AUTOMATISCHE SPRACH-ERKENNUNG IN DER RECHNERGESTUETZEN KARTOGRAPHIE]
Theodor M. Johannsen *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 13-26 refs In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

N81-33524# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPRODUCTION OF LAND MAP CIRCULATION RUNS BY MEANS OF COLOR SEPARATION PROCEDURES [NACHDRUCK VON LANDKARTEN-AUFLAGENDRUCKEN MITTELS FARBAUSZUGSVERFAHREN]
Helmut Muehle *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 27-74 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

N81-33525# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
OVSUP: A PROGRAM FOR COMPUTER-AIDED DISENTANGLEMENT OF OVERLAPPING ZONES [OVSUP: EIN PROGRAMM ZUR EDV-GESTUETZTEN ENTFLECHTUNG DER UEBERLAPPUNGSSTELLAN VERBREITER LINIENHAFTER KARTENELSENENTE]
Roland Schittenhelm *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 75-82 refs In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

N81-33526# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PHOTOGRAMMETRY IN CHINA
Zhi-zhou Wang (Wuhan Coll. of Geodesy, Photogrammetry and Cartography, China) *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 80 1980 p 83-89 In GERMAN; ENGLISH summary (For primary document see N81-33521 24-42)
Avail: NTIS HC A05/MF A01

N81-33528# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PARTIALLY AUTOMATED OBJECT EXTRACTION FROM AERIAL PHOTOGRAPHS AND LAND MAPS [TEILAUTOMATISCHE OBJELTEXTRAKTION AUS LUFTBILDERN UND LANDKARTEN]
U. Bausch, W. D. Groch, W. Kestner, and M. Sties *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 7-22 refs In GERMAN; ENGLISN summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

N81-33534# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DEVELOPMENT OF DIGITAL HEIGHT MODELS FROM CONTOURLINE REPRESENTATIONS [ENTWICKLUNG DIGITALER HOEHENMODELLE AUS HOEHENLINIENDARSTELLUNGEN]
Kurt Menke *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 77-94 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

N81-33535# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE FIRST NAUTICAL CHARTS PRODUCED BY THE GERMAN HYDROGRAPHIC INSTITUTE BY MEANS OF AUTOMATIC DATA PROCESSING [DIE ERSTEN IM DEUTSCHEN HYDROGRAPHISCHEN INSTITUT MIT ADV-UNTERSTUETZUNG ERSTELLTEN SEEKARTEN]
Karl-Wilhelm Schrick *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 95-99 ref In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

N81-33536# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE TOPOGRAPHICAL DATA BASE SYSTEM TOPSY [DAS TOPOGRAPHISCHE DATENBANKSYSTEM TOPSY]
Wilfried Staufenbiel *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 101-110 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N81-33601*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCES IN MEMBRANE TECHNOLOGY FOR THE NASA REDOX ENERGY STORAGE SYSTEM
Jerri S. Ling and JoAnn Charleston 1980 18 p refs Presented at Electrochem. Soc. Meeting, Hollywood, Fla., 5-10 Sep. 1980 (Contract DE-AI04-80AL-12726)
(NASA-TM-82701; DOE/NASA/12726-12; E-738) Avail: NTIS HC A02/MF A01 CSCL 10A

Anion exchange membranes used in the system serve as a charge transferring medium as well as a reactant separator and are the key enabling component in this storage technology. Each membrane formulation undergoes a series of screening tests for area-resistivity, static (non-flow) diffusion rate determination, and performance in Redox systems. The CDIL series of membranes has, by virtue of its chemical stability and high ion exchange capacity, demonstrated superior properties in the redox environment. Additional resistivity results at several acid and iron solution concentrations, iron diffusion rates, and time dependent iron fouling of the various membrane formulations are presented in comparison to past standard formulations. T.M.

N81-33602*# Lockheed Missiles and Space Co., Huntsville, Ala.
WIND FLOW CHARACTERISTICS IN THE WAKES OF LARGE WIND TURBINES. VOLUME 1: ANALYTICAL MODEL DEVELOPMENT
W. R. Eberle Sep. 1981 217 p refs
(Contracts DEN3-29; EX-76-I-01-1028)
(NASA-CR-165380; DOE/NASA/0029-1; LMSC-LOREC-D000008-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 10A

A computer program to calculate the wake downwind of a wind turbine was developed. Turbine wake characteristics are useful for determining optimum arrays for wind turbine farms. The analytical model is based on the characteristics of a turbulent coflowing jet with modification for the effects of atmospheric turbulence. The program calculates overall wake characteristics, wind profiles, and power recovery for a wind turbine directly in the wake of another turbine, as functions of distance downwind of the turbine. The calculation procedure is described in detail, and sample results are presented to illustrate the general behavior of the wake and the effects of principal input parameters. T.M.

N81-33603*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPARATIVE ASSESSMENT OF SOLAR THERMAL ELECTRIC POWER PLANTS IN THE 1-10 MWe RANGE
L. S. Rosenberg and W. R. Revere Jun. 1981 80 p refs
(Contracts NAS7-100; DE-AT04-81AL-16228; JPL Proj. 5105-88)
(NASA-CR-164854; JPL-Pub-81-53; DOE/JPL-1060/21) Avail: NTIS HC A05/MF A01 CSCL 10A

The candidate power system technologies were ranked in terms of the cost of electric energy each system produces. In all cases, it was assumed that development programs would result in mature power plant systems that could be commercially manufactured. The results of the study, a brief description of the systems examined, and the methodologies used are presented. T.M.

N81-33604*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF THE EFFECTS OF A FREEZE/THAW ENVIRONMENT ON CELLULAR GLASS

P. Frickland, E. Cleland, and T. Hasegawa 15 Aug. 1981 73 p refs
(Contract NAS7-100; DE-AT04-81AL-16228; JPL Proj. 5105-81)
(NASA-CR-164856; JPL-Pub-81-29; DOE/JPL-1060/44) Avail: NTIS HC A04/MF A01 CSCL 01A

Using the evaluation criteria of water vapor permeability and conformability, a protective butylrubber/silicone conformal coating system was selected for use on Foamglas substrates in a freeze/thaw environment. The selection of a specific freeze/thaw cycle which closely models field conditions is discussed. A sampling plan is described which allows independent evaluation of the effects of conformal coatings, cycle number and location within the environmental chamber. The results of visual examination, measurement of density, modulus of rupture and Young's modulus are reported. Based upon statistical evaluation of the experimental results, it is concluded that no degradation in mechanical properties of either coated or uncoated Foamglas occurred within the duration of the test (53 freeze/thaw cycles). T.M.

N81-33605*# Spire Corp., Bedford, Mass.
INTEGRAL GLASS ENCAPSULATION FOR SOLAR ARRAYS Final Report
G. A. Landis Jul. 1981 79 p refs Sponsored in part by DOE Prepared for JPL
(DOE/JPL-954521-81/15; JPL-9950-589; FR-81-10046) Avail: NTIS HC A05/MF A01

Electrostatic bonding technology, an encapsulation technique for terrestrial solar array was developed. The process produces full integral, hermetic bonds with no adhesives or pottants. Panels of six solar cells on a simple glass superstrate were produced. Electrostatic bonding for making the cell front contact was also developed. A metal mesh is trapped into contact with the cell front during the bonding process. Six cell panels using the bonded mesh as the only cell front contact were produced. The possibility of using lower cost glass, with a higher thermal expansion mismatch to silicon, by making lower temperature bonds is developed. However, this requires a planar surface cell. E.A.K.

N81-33606*# California Inst. of Tech., Pasadena.
EVALUATION AND VERIFICATION OF EPITAXIAL PROCESS SEQUENCE FOR SILICON SOLAR CELL PRODUCTION Quarterly Report, 1 Apr. - 30 Jun. 1981
D. Redfield Jul. 1981 21 p refs Sponsored in part by DOE Prepared for JPL
(Contract NAS7-100)
(NASA-CR-164875; DOE/JPL-955825-81/2; JPL-9950-590; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

The applicability of solar cell and module processing sequences, to be used on lower cost epitaxial silicon wafers was evaluated. The extent to which the process sequences perform effectively when applied to film solar cells formed by epitaxial deposition of Si on potentially inexpensive substrates of upgraded metallurgical grade Si is examined. It is concluded that these substrates are satisfactory in their cell performance. E.A.K.

N81-33607*# Pennsylvania Univ., Philadelphia.
ANALYSIS AND EVALUATION IN THE PRODUCTION PROCESS AND EQUIPMENT AREA OF THE LOW-COST SOLAR ARRAY PROJECT Final Report
M. Wolf Apr. 1981 319 p refs Sponsored by NASA and DOE Prepared for JPL, California Inst. of Tech., Pasadena
(Contract JPL-954976)
(NASA-CR-164867; DOE/JPL-954976-81/13) Avail: NTIS HC A14/MF A01 CSCL 10A

The effect of solar cell metallization pattern design on solar cell performance and the costs and performance effects of different metallization processes are discussed. Definitive design rules for the front metallization pattern for large area solar cells are presented. Chemical and physical deposition processes for metallization are described and compared. An economic evaluation of the 6 principal metallization options is presented. Instructions for preparing Format A cost data for solar cell manufacturing processes from UPPC forms for input into the SAMIC computer program are presented. J.D.H.

N81-33608*# Energy Materials Corp., Harvard, Mass.
LOW-COST SOLAR ARRAY PROJECT TASK 1: SILICON MATERIAL. GASEOUS MELT REPLENISHMENT SYSTEM Final Report, Apr. 1979 - Oct. 1980
D. N. Jewett, H. E. Bates, and D. M. Hill Oct. 1980 60 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955269)
(NASA-CR-163764; DOE/JPL-955269-80/6; JPL-9950-596) Avail: NTIS HC A04/MF A01 CSCL 10A

The operation of a silicon production technique was demonstrated. The essentials of the method comprise chemical vapor deposition of silicon, by hydrogen reduction of chlorosilanes, on the inside of a quartz reaction vessel having large internal surface area. The system was designed to allow successive deposition-melting cycles, with silicon removal being accomplished by discharging the molten silicon. The liquid product would be suitable for transfer to a crystal growth process, casting into solid form, or production of shots. A scaled-down prototype reactor demonstrated single pass conversion efficiency of 20 percent and deposition rates and energy consumption better than conventional Siemens reactors, via deposition rates of 365 microns/hr. and electrical consumption of 35 Kwhr/kg of silicon produced. T.M.

N81-33609*# Westinghouse Electric Corp., East Pittsburgh, Pa. Advanced Energy Systems Div.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Quarterly Report, 1 Jun. - 31 Aug. 1981
31 Aug. 1981 61 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955909)
(NASA-CR-164877; DOE/JPL-955909-81/3; JPL-9950-595; QR-3) Avail: NTIS HC A04/MF A01 CSCL 10A

Subsequent to the design review, a series of tests was conducted on simulated modules to demonstrate that all environmental specifications (wind loading, hailstone impact, thermal cycling, and humidity cycling) are satisfied by the design. All tests, except hailstone impact, were successfully completed. The assembly sequence was simplified by virtue of eliminating the frame components and assembly steps. Performance was improved by reducing the module edge border required to accommodate the frame of the preliminary design module. An ultrasonic rolling spot bonding technique was selected for use in the machine to perform the aluminum interconnect to cell metallization electrical joints required in the MEPSDU module configuration. This selection was based on extensive experimental tests and economic analyses. T.M.

N81-33610*# General Electric Co., Philadelphia, Pa. Energy Systems and Technology Div.
INTEGRATED RESIDENTIAL PHOTOVOLTAIC ARRAY DEVELOPMENT
N. F. Shepard, Jr. 14 Aug. 1981 74 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955894)
(NASA-CR-164865; DOE/JPL-955894-3) Avail: NTIS HC A04/MF A01 CSCL 10A

The design details of an optimized integrated residential photovoltaic module/array are presented. This selected design features a waterproofing and mounting scheme which was devised to simplify the installation procedures by the avoidance of complex gasketed or caulked joints, while still maintaining a high confidence that the watertight integrity of the integral roofing surface will be achieved for the design lifetime of the system. The production and installation costs for the selected module/array design are reported for a range of annual production rates as a function of the cost of solar cells. M.G.

N81-33611*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR COOLING SYSTEM PERFORMANCE, FRENCHMAN'S REEF HOTEL, VIRGIN ISLANDS Final Report
Harry Harber 25 Sep. 1981 25 p refs
(Contracts DEN8-00005; DEN8-00007; DEN8-0000021)
(NASA-TM-82442) Avail: NTIS HC A02/MF A01 CSCL 10A

The operational and thermal performance of a variety of

solar systems are described. The Solar Cooling System was installed in a hotel at St. Thomas, U. S. Virgin Islands. The system consists of the evacuated glass tube collectors, two 2500 gallon tanks, pumps, computerized controller, a large solar optimized industrial sized lithium bromide absorption chiller, and associated plumbing. Solar heated water is pumped through the system to the designed public areas such as lobby, lounges, restaurant and hallways. Auxiliary heat is provided by steam and a heat exchanger to supplement the solar heat. E.A.K.

N81-33612*# LinCom Corp., Pasadena, Calif.
SOLAR POWER SATELLITE ANTENNA PHASE CONTROL SYSTEM HARDWARE SIMULATION, PHASE 4: VOLUME 1: EXECUTIVE SUMMARY Final Report
W. C. Lindsey, A. V. Kantak, and C. M. Chie Mar. 1981 22 p refs 3 Vol.
(Contract NAS9-16097)
(NASA-CR-167393; TR-0381-1280-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The phase control system is described. Potential sources of phase error are identified and the performance leading to selection of the allowable phase error for each source is summarized. The pilot transmitter, the effects of ionospheric, the master slave returnable timing system (MSRTS), the SPS receiver, and the high power amplifier for dc to microwave conversion are considered separately. Design parameters of the pilot transmitter and spacetenna transponder are presented. J.D.H.

N81-33613*# LinCom Corp., Pasadena, Calif.
SOLAR POWER SATELLITE ANTENNA PHASE CONTROL SYSTEM HARDWARE SIMULATION, PHASE 4. VOLUME 2: ANALYTICAL SIMULATION OF SPS SYSTEM PERFORMANCE Final Report
W. C. Lindsey, A. V. Kantak, and C. M. Chie Mar. 1981 93 p refs 3 Vol.
(Contract NAS9-16097)
(NASA-CR-167394; TR-0381-1280-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 10A

The pilot signal parameter optimization and power transponder analyses are presented. The SPS antenna phase control system is modeled and the hardware simulation study described. Ionospheric and system phase error effects and the effects of high power amplifier phase and amplitude jitters are considered. Parameter optimization of the spread spectrum receiver, consisting of the carrier tracking loop and the code tracking loop, is described. J.D.H.

N81-33614*# LinCom Corp., Pasadena, Calif.
SOLAR POWER SATELLITE ANTENNA PHASE CONTROL SYSTEM HARDWARE SIMULATION, PHASE 4. VOLUME 3: SOLARSIM USERS MANUAL Final Report
W. C. Lindsey, A. V. Kantak, and C. M. Chie Mar. 1981 41 p refs 3 Vol.
(Contract NAS9-16097)
(NASA-CR-167395; TR-0381-1280-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Documentation of the interactive software package designed to predict the effect of certain electrical and mechanical imperfections on the performance of the SPS system is presented. The capabilities of the SOLARSIM program to quantify the spacetenna performance parameter values are described. The SOLARSIM package can compute the RMS pointing error, title effects, MPTX code tracking loop performance, MPTX carrier tracking loop performance, averaged power pattern, and the power transfer efficiency. J.D.H.

N81-33615*# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
EVALUATION OF A WIND TURBINE ELECTRIC POWER GENERATOR Final Report, 1 Jun. 1980 - 15 Sep. 1981
William B. Swim 15 Oct. 1981 180 p
(Grant NAG8-007)
(NASA-CR-164879) Avail: NTIS HC A09/MF A01 CSCL 10A

A technical assessment of the aerodynamic performance of the wind wheel turbine (WWT) is reported. The potential of the WWT in utilizing wind as an alternate power source was evaluated. Scaling parameters were developed to predict the aerodynamic performance of WWT prototype sized to produce 3, 9, 30, and 100 kw outputs in a 6.7 m/sec wind. T.M.

N81-33616# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NUMERICAL SOLUTION OF NATURAL CONVECTION IN AN INCLINED RECTANGULAR CAVITY WITH PARTITIONS M.S. Thesis
Thomas K. Toltzien Dec. 1980 96 p refs
(AD-A103389; AFIT/GAE/AA/80D-23) Avail: NTIS HC A05/MF A01 CSCL 10/1

A numerical investigation was conducted on two-dimensional natural convection within inclined rectangular enclosures partitioned into 45 degree triangular cells. The time dependent governing equations, vorticity, energy, and stream function, were solved by an ADI method and a Gauss-Seidel SOR technique. The numerical procedure was validated for rectangular enclosures, then modified for triangular cells. Heat transfer coefficients were determined for an inclined square enclosure with a diagonal partition for Grashof numbers less than 200,000 and inclination angles between 10 degrees and 90 degrees. These results show a diagonal partition reduces the heat transferred by natural convection across an inclined square enclosure by more than 50%. Author (GRA)

N81-33617# Optical Coating Lab., Inc., Santa Rosa, Calif.
FABRICATION OF INTEGRAL SOLAR CELL COVERS BY THE PLASMA ACTIVATED SOURCE Final Report, Jun. 1979 - Sep. 1980
H. S. Gurev Jan. 1981 77 p refs
(Contract F33615-79-C-2046; AF Proj. 3145)
(AD-A103522; AFWAL-TR-80-2124) Avail: NTIS HC A05/MF A01 CSCL 11/3

An RF plasma in oxygen was used as a source for activated oxygen molecules which were reacted with, for example, silane at a solar cell surface to deposit amorphous silicon dioxide on the solar cell, to act as a protective cover. One hundred micrometers of SiO2 could be deposited. The coatings exhibited considerable intrinsic stress on 12-mil cells. Attempts to reduce the stress by mixing Al2O3 with SiO2 were not successful because of insufficient control of the mixing ratio. Author (GRA)

N81-33618# Woods Hole Oceanographic Institution, Mass.
VAX-11 PROGRAMS FOR COMPUTING AVAILABLE POTENTIAL ENERGY FROM CTD DATA
Nancy Amanda Bray Aug. 1981 140 p refs
(Contracts N00014-76-C-0197; N00014-79-C-0071; Grant NSF OCE-77-19403; NR Proj. 083-400; NR Proj. 083-004)
(AD-A103892; WHOI-81-70) Avail: NTIS HC A07/MF A01 CSCL 08/10

This report documents the W.H.O.I. VAX-11 programs used to calculate available potential energy and related quantities from CTD data using the technique described in Bray and Fofonoff (1981). The report includes examples of how the programs may be used, as well as complete listings of all the required FORTRAN files. Author (GRA)

N81-33619# Argonne National Lab., Ill.
TECHNICAL SUPPORT FOR OPEN-CYCLE MHD PROGRAM Progress Report, Jul. - Sep. 1979
G. F. Berry, ed. Jun. 1981 123 p refs
(Contract W-31-109-eng-38)
(DE81-027564; ANL/MHD-80-2) Avail: NTIS HC A06/MF A01

The support program for open cycle MHD which consists of developing the analytical tools needed for investigation of the performance of the major components in the combined cycle MHD/steam power system is described. The primary components of the systems, unique to MHD, and the integration of these analytical models into a mode for the entire power producing system are examined. The project includes modeling of the secondary combustor, generator, seed deposition, and formation and decomposition of NO. Costing models were developed to assess the effect of parameter changes on cost of electricity. Parametric studies are performed to evaluate the performance of the U-25B generator and to support the design of the US U-25B generator. DOE

N81-33620# Argonne National Lab., Ill.
ADVANCED-BATTERY TECHNOLOGIES: WHERE ARE THEY NOW?
Neng-Ping Yao 1980 43 p refs Presented at the Ind. Chem. Session Mod. Eng. and Technol. Seminar, Taipei, Taiwan, 7-25 Jul. 1980
(Contract W-31-109-eng-38)
(CONF-8007103-1) Avail: NTIS HC A03/MF A01

Near term and advanced secondary batteries for application to electric utility load leveling, electric vehicles, and solar photovoltaic power systems are reviewed. Lead acid, iron nickel oxide, and zinc nickel oxide systems are the potential near term candidates for electric vehicle applications. In the near term EV battery program, technological progress was made in the areas of specific energy, specific power, and manufacturing engineering. Cycle life enhancement and reduction of battery cost are emphasized. In parallel to the near term battery program is the research and development of advanced batteries which have potentials of higher performance and lower cost. DOE

N81-33621# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ADVANCES IN THE SERI-DOE ELECTROCHEMICAL PHOTOVOLTAIC CELL PROGRAM
W. Wallace, Rommel Noufi, and Saiyen Deb May 1981 8 p refs Presented at the IEEE PV Specialists Conf., Orlando, Fla., 12-15 May 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-025908; SERI/TP-613-1224; CONF-810526-34) Avail: NTIS HC A02/MF A01

The electrochemical photovoltaic cell program to evaluate the photovoltaic energy conversion efficiency, stability and storage potential of amorphous and polycrystalline semiconductor/electrolyte systems is described. Technologies capable of the conversion of light energy into electrical energy either directly in regenerative electrochemical photovoltaic devices or indirectly in overall regenerative cyclic systems incorporating storage are described. The goal of the program is to develop and demonstrate the viability of low cost electrochemical photovoltaic cells competitive with solid state photovoltaic devices and photoelectrochemical storage systems competitive with battery connected photovoltaic array storage. DOE

N81-33622# Midwest Research Inst., Golden, Colo. Planning, Applications, and Impacts Div.
ENVIRONMENTAL, HEALTH, SAFETY, AND REGULATORY REVIEW OF SELECTED PHOTOVOLTAIC OPTIONS: COPPER SULFIDE/CADMIUM SULFIDE AND POLYCRYSTALLINE SILICON
Kathryn Lawrence, Sue Morgan, David Schaller, and Thomas Wilczak Jun. 1981 240 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-027294; SERI/TR-743-799) Avail: NTIS HC A11/MF A01

Emissions, effluents and solid wastes from the fabrication of both polycrystalline silicon and front-wall copper sulfide/cadmium sulfide photovoltaic cells are summarized. Environmental, health, and safety characteristics of cell fabrication material inputs and by products are listed. Candidate waste stream treatment methods and resultant effluents are reviewed. Environmental, health, and safety effects of photovoltaic cell/module/array installation, operation, maintenance, and decommission are summarized. Federal legislation is addressed and future regulatory trends under these laws as they may affect each cell process are discussed. Water quality, solid waste disposal, and occupational health and safety regulations will likely be those most applicable to commercial scale PV production. Currently available control technology appears sufficient to treat cell fabrication wastes. DOE

N81-33623# Florida Solar Energy Center, Cape Canaveral.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 1: THE STATE OF SOLAR ENERGY TECHNOLOGY
D. L. Block Apr. 1981 27 p refs
(Contract DE-FC02-79CS-30278)
(DE81-029002; DOE/CS-30278/T15) Avail: NTIS HC A03/MF A01

The state of solar energy technology, economic considerations, problems/needs, and suggested government is assessed. Solar industry and state and local government actions are discussed. The federal government programs and the role of the federal government are emphasized. It is anticipated that the photovoltaics, passive, biomass, hot water, space heating and wind programs are all within short term of the private marketplace. DOE

N81-33624# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 9: DESIGN APPROACHES: CAES Final Report
Apr. 1981 191 p
(Contract DE-AC02-77ET-28013; EPRI Proj. 5047-9)
(DE81-027704; EPRI-EM-1589-Vol-9) Avail: NTIS HC A09/MF A01

Durin- Task 3C of the PEPCO/CAES study detailed design requirements and alternate designs were developed for the major components and systems of the CAES plant. Based upon a preliminary economic and technical evaluation, preferred designs were chosen as the basis for subsequent development in Task 5C. A summary of the project design criteria, a pressure optimization study, and the design approaches for the major plant systems which were developed are presented. The performance, operation and control capabilities of the plant and the results of the preliminary cost estimate are reported. T.M.

N81-33625# Midwest Research Inst., Golden, Colo. Developing Countries Branch.
WIND POWER FOR DEVELOPING NATIONS
Amir S. Mikhail Jul. 1981 331 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-025792; SERI/TR-762-966) Avail: NTIS HC A15/MF A01

The global potential of wind energy conversion systems (WECS) was assessed. The cost effectiveness of WECS depends on the availability of the wind resource, system power performance, and the comparative cost of alternative energy sources. An overview of the global wind resource including observed zonal wind systems for each continent, available wind data, current wind maps, and ongoing studies to assess the global wind potential are presented. A methodology to obtain a match between machine and site characteristics for most cost effective power production is outlined. DOE

N81-33626# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SIMULATED PERFORMANCE OF THE STAND-ALONE PHOTOVOLTAIC SYSTEM AT NATURAL BRIDGES NATIONAL MONUMENT
B. L. Grossman Mar. 1981 39 p
(Contract DE-AC02-76ET-20279)
(DE81-027274; DOE/ET-20279/125) Avail: NTIS HC A03/MF A01

A stand alone photovoltaic (PV) system was evaluated. A computer model was used to describe and analyze the individual system components and the performance of the system as a whole. Various methods of looking at system performance are identified and explored: (1) available array energy; (2) yearly energy flow; and (3) load categorization. These methods provide a basis for design and operational refinements as well as a reference for future analyses using actual data. DOE

N81-33627# Sandia Labs., Albuquerque, N. Mex.
HANDBOOK FOR THE CONCEPTUAL DESIGN OF PARABOLIC TROUGH SOLAR ENERGY SYSTEMS PROCESS HEAT APPLICATIONS
R. W. Harrigan Jul. 1981 320 p refs
(DE81-029290; SAND-81-0763) Avail: NTIS HC A14/MF A01

This report presents the techniques needed to execute conceptual designs of process heat systems employing parabolic trough solar collectors. The design tools are presented in graphical format, and each of 26 SOLMET sites is explicitly represented. The conceptual design resultant from the application of the design charts contained within this handbook approximates the collector area needed to displace a constant thermal demand, the land

area needed for collector deployment, the appropriate quantity of sensible heat storage, the fraction of fossil fuel displaced by solar, and the capital cost of the collector-storage subsystem. DOE

N81-33628# Sandia Labs., Albuquerque, N. Mex. Dept. of Solar Energy Projects.
MODULAR INDUSTRIAL SOLAR RETROFIT SYSTEM CONSTRAINTS, SPECIFICATIONS, AND GUIDELINES
Karl Wally, ed. Aug. 1981 60 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029289; SAND-81-1300) Avail: NTIS HC A04/MF A01

A programmatic, physical and regulatory reference environment for which the systems shall be designed is defined. This encompasses a large segment of process steam applications, so that system designs developed for it will be widely applicable with little or no modification. Minimum design requirements at all levels are detailed, and design methodologies, features, and practices are recommended for consideration in any MISR design. DOE

N81-33629# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ORGANIC RANKINE CYCLE COUPLED TO A SOLAR POND BY DIRECT-CONTACT HEAT EXCHANGE: SELECTION OF A WORKING FLUID
John D. Wright Jun. 1981 35 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-028400; SERI/TR-631-1122) Avail: NTIS HC A03/MF A01

The saturated and halogenated hydrocarbons for use as working fluids were evaluated. It is posited that heat from a solar pond may be used to drive an organic Rankine cycle and produce electricity. Use of a direct contact boiler, in which the organic fluid is bubbled through a stream of pond brine, may reduce the plant cost by about 25%. Low vapor pressure fluids maximize cycle efficiency by minimizing pumping requirements, but require a larger turbine. It is found that pentane is the working fluid best suited to this application because of its high efficiency, low solubility in the pond, and reasonable turbine cost. DOE

N81-33630# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC-SYSTEM APPLICATION: EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 1 FOR NEWMAN POWER STATION SITE, EL PASO, TEXAS
Jul. 1981 16 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE81-029283; SAND-81-7086/1) Avail: NTIS HC A02/MF A01

A project is described for application of a photovoltaic power supply to computers that control the operation of a combined cycle power plant. The photovoltaic power supply will be used with an existing DC facility. The project is briefly outlined, and the participants are listed. Relevant weather data and reference operating conditions are given and four operational and collection modes are described. System specifications are given and the solar array, protection, and data acquisition and instrumentation subsystems are described. DOE

N81-33631# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION: FIRST MANUFACTURED HOMES (LOT 219) SINGLE FAMILY RESIDENCE, LUBBOCK, TEXAS
D. Moore 21 Aug. 1981 50 p
(Contracts DE-AB01-76CS-31020; HUD-H-2372)
(DE81-028120; SOLAR/1047-81/50) Avail: NTIS HC A03/MF A01

A system designed to provide solar space heating and to preheat domestic hot water is described. The collector, storage, energy to load, and auxiliary subsystems are described. Operation of the solar and auxiliary systems may involve one or more of five modes of operations: collector to storage, direct solar to space heating, storage to space heating, preheating domestic hot water, and auxiliary space heating. Original cost estimates for provisioning and installation of the solar system are given. DOE

N81-33632# Hittman Associates, Inc., Columbia, Md.
EVALUATION OF HYBRID SOLAR/FOSSIL RANKINE-COOLING CONCEPT
H. M. Curran Nov. 1980 29 p refs
(Contract DE-AC03-79CS-30202)
(DOE/CS-30202/T3; H-C1007/010-80-990) Avail: NTIS HC A03/MF A01

The hybrid solar/fossil Rankine cycle is analyzed thermodynamically to determine fuel use and efficiency. The hybrid system is briefly compared with solar organic Rankine systems with a fossil fuel auxiliary mode, and with geothermal resources. The economic evaluation compares the present value of the superheater fuel cost over the system lifetime with the first cost reduction obtained by substituting a hybrid solar/fossil Rankine engine. The economics analysis indicates that even if the hybrid solar/fossil Rankine cooling system were developed to the point of being a commercial product with an economic advantage over an otherwise equivalent solar organic Rankine cooling system, it would gradually lose that advantage with rising fuel costs and decreasing collector costs. From the standpoint of national fossil fuel conservation, the hybrid concept would be preferable only in applications where the operating duration in the solar/fossil mode would be substantially greater than in the fossil fuel only auxiliary mode. DOE

N81-33633# Science Applications, Inc., Palo Alto, Calif.
RELIABILITY OF MODULARIZED ENERGY STORAGE SYSTEMS Interim Report
S. L. Basin Electric Power Research Inst. Jun. 1981 209 p refs Sponsored by the Electric Power Research Inst.
(EPRI Proj. 370-17)
(DE81-903725; EPRI-EM-1890) Avail: NTIS HC A10/MF A01

The reliability of modularized electric battery energy storage systems is discussed. The measures of performance include: (1) the time to first failure of the system: (2) the time between successive system failure: (3) available capacity, and (4) the number of module replacements over the planned system lifetime. The effect of module aging, under the assumption of a family of monotone failure rate distribution, is considered. DOE

N81-33634# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
IMPROVED BETA-ALUMINA ELECTROLYTES FOR ADVANCED STORAGE BATTERIES Progress Report, 1 Sep. 1978 - 31 Sep. 1980
Lutgard C. DeJonghe Sep. 1980 85 p refs
(Contract W-7405-eng-48)
(DE81-028118; LBL-12357) Avail: NTIS HC A05/MF A01

The mechanisms of electrochemical failure initiation and propagation for polycrystalline Na-(ALPHA) alumina tubes used for the advanced storage beta batteries were determined. Beta batteries, using sodium beta alumina solid electrolytes as an ion permeable separator between molten sodium metal and sodium polysulphide storage electrodes are discussed. The ultimate viability of the system is the lifetime of the solid electrolyte upon cell cycling. A variety of electrolyte degradation processes takes place simultaneously. These factors that contribute adversely to slow, in-cell electrolyte degradation or to rapid failure are determined. DOE

N81-33635# Sandia Labs., Albuquerque, N. Mex. Energy Systems and Technology Div.
DESIGN OF A PHOTOVOLTAIC SYSTEM WITH ON-SITE STORAGE FOR A SOUTHWEST ALL-ELECTRIC RESIDENCE
E. M. Mehalick, R. Felice, G. J. Tully, J. Johnson, J. Parker, and G. OBrien Jun. 1981 220 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029282; SAND-80-7170) Avail: NTIS HC A10/MF A01

The design of a photovoltaic residence employing on-site storage has been developed for a south-western site. Performance data is provided for Phoenix and Albuquerque locations. The

roof mounted array is typical of projected retrofit installations. Detailed installation and electrical drawings are provided. DOE

N81-33636# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
ENERGY CONVERSION BASED ON MOLECULAR EXCITED STATES Progress Report, 1 Aug. 1980 - 31 Jul. 1981
T. J. Meyer 1981 8 p refs
(Contract DE-AS05-78ER-06034)
(DE81-028940; DOE/ER-06034/3) Avail: NTIS HC A02/MF A01

The use of molecular excited states in energy conversion processes was investigated. Progress is summarized on: properties of Os complexes, preparation of a polymeric complex, mechanistic studies of photochemical intermediates, oxidation of water catalyzed by Ru(bpy)2(H2O)2(2), and development of excited state photoelectrochemical cells. DOE

N81-33637# Aerodyne Research, Inc., Bedford, Mass. Center for Chemical and Environmental Physics.
CHARACTERIZATION OF OPEN-CYCLE COAL-FIRED MHD GENERATORS Quarterly Technical Progress Report, 1 Feb. - 31 Jul. 1980
J. Wormhoudt, V. Yousefian, M. Weinberg, C. Kolb, M. Martinez-Sanchez, W. Cheng, F. Bien, D. Dvore, W. Unkel, and G. Stewart Sep. 1980 64 p refs
(Contracts EX-76-C-01-2478; DE-AC01-76ET-10775)
(DOE/ET-10775/T1; QR-14; QR-15) Avail: NTIS HC A04/MF A01

The successful design of full-scale, open-cycle, coal-fired MHD generators for baseload electrical production requires a detailed understanding of the plasma chemical and plasma dynamic characteristics of anticipated combustor and channel fluids. Progress in efforts to model the efficiency of an open-cycle, coal-fired MHD channel based on the characterization of the channel flow as well as laboratory experiments to validate the modeling effort is detailed. In addition, studies related to understanding arcing phenomena in the vicinity of an anode are reported. DOE

N81-33638# Northrup, Inc., Hutchins, Tex.
SECOND-GENERATION HELIOSTAT DEVELOPMENT, VOLUME 2. Final Report, 16 Jul. 1979 - 31 Mar. 1981
Mar. 1981 172 p refs Prepared in cooperation with Bechtel National, Inc. and Booz-Allen and Hamilton, Inc. Prepared for Sandia National Labs.
(Contract DE-AC04-76DP-00789)
(DE81-028869; SAND-81-8178-Vol-2) Avail: NTIS HC A08/MF A01

The designs, methods, and procedures involving the field assembly and installation of heliostats are described. About 50% of the maintenance cost is related to mirror washing. Mechanical maintenance, constituting about 35% of the total, involves clean up and painting of steel parts. Electrical and electronic components maintenance is also discussed. The cost per installed heliostat and the annual cost of owning, operating and maintaining a collector subsystem for a 50 MWe (peak) solar central receiver electrical power plant are determined. DOE

N81-33639# Thermo Electron Corp., Waltham, Mass.
DOE ADVANCED THERMIONIC TECHNOLOGY PROGRAM Progress Report, Jan. - Mar. 1981
1981 58 p refs
(Contract DE-AC02-81ET-11291)
(DE81-027307; TE-4258-247-81; PR-46) Avail: NTIS HC A04/MF A01

Progress over a 3 month period in thermionic performance is reported. Significant accomplishments included: (1) continuing stable output from the combustion test of the one inch diameter hemispherical silicon carbide diode at an emitter temperature of 1730 K for a period of over 6400 hours; (2) demonstration of an additive oxygen effect in a research diode with a cesium graphite reservoir located in the collector; (3) preliminary testing of the four diode module; and (4) evaluation of a research diode with ZrO2-Mo cermet electrodes. DOE

N81-33640# Northrup, Inc., Hutchins, Tex.
SECOND-GENERATION HELIOSTAT DEVELOPMENT. VOLUME 3: APPENDICES A-E Final Report, 16 Jul. 1979 - 31 Mar. 1981
Mar. 1981 267 p refs Prepared in cooperation with Bechtel National, Inc. and Booz-Allen and Hamilton, Inc. Prepared for Sandia National Labs.
(DE81-028866; SAND-81-8178-Vol-3) Avail: NTIS HC A12/MF A01

The bill of material of the heliostat is tabulated. Portions of the drawings defining the heliostat subassemblies and assembly drawings are presented. On-site heliostat assembly and installation are summarized. Trade studies performed in the course of the design progression which lead to the current configuration are presented. Studies on wind loads, distribution, and moments, wind and gravity deflections, thermal curvature and stress, stress analysis in 90 mph wind, and drive unit performance are presented. DOE

N81-33641# Yale Univ., New Haven, Conn.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 2: PASSIVE SOLAR TECHNOLOGY
Donald Watson Apr. 1981 61 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029003; DOE/CS-30278/T16-Vol-2) Avail: NTIS HC A04/MF A01

The status of passive solar heating and cooling for residential, commercial, and agricultural applications, and of daylighting is summarized. Passive solar energy is used in the broad sense describing a comprehensive approach to design that considers all climatic impacts on a building, and includes planning on the multi-building scale. The key roles of the designer and of innovation in the building industry are discussed. Numerous terms are defined and the origins of several are discussed. Passive design principles are summarized. Performance and costs of passive solar technologies are examined. Passive energy design tools and methods are considered in the context of the overall process by which building decisions are made to achieve the integration of new techniques into conventional design. DOE

N81-33642# Colorado State Univ., Fort Collins.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 3: ACTIVE SPACE HEATING AND HOT WATER SUPPLY WITH SOLAR ENERGY
S. Karaki and G. O. G. Loef Apr. 1981 35 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029004; DOE/CS-30278/T12-Vol-3) Avail: NTIS HC A03/MF A01

Several types of solar water heaters are described and assessed. These include thermosiphon water heaters and pump circulation water heaters. Auxiliary water heating is briefly discussed, and new and retrofit systems are compared. Liquid-based space heating systems and solar air heaters are described and assessed, auxiliary space heating are discussed, and new and retrofit solar space heating systems are compared. The status of flat plate collectors, evacuated tube collectors, and thermal storage systems is examined. Systems improvements, reliability, durability and maintenance are discussed. The economic assessment of space and water heating systems includes a comparison of new systems costs with conventional fuels, and sales history and projections. The variety of participants in the solar industry and users of solar heat is discussed, and various incentives and barriers to solar heating are examined. Several policy implications are discussed, and specific government actions are recommended. DOE

N81-33643# Arizona State Univ., Tempe. College of Architecture.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 4: SOLAR AIR CONDITIONING: ACTIVE, HYBRID AND PASSIVE
John I. Yellott Apr. 1981 58 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029005; DOE/CS-20278/T5-Vol-4) Avail: NTIS HC A04/MF A01

The status of absorption cycle solar air conditioning and the

Rankine cycle solar cooling system is reviewed. Vapor jet ejector chillers, solar pond based cooling, and photovoltaic compression air conditioning are also briefly discussed. Hybrid solar cooling by direct and indirect evaporative cooling, and dehumidification by desiccation are described and discussed. Passive solar cooling by convective and radiative processes, evaporative cooling by passive processes, and cooling with roof ponds and movable insulation are reviewed. Federal and state involvement in solar cooling is discussed. DOE

N81-33644# Tennessee Univ., Knoxville. Energy, Environment and Resources Center.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 5: SOLAR INDUSTRIAL PROCESS HEAT
Edward Lumsdaine Apr. 1981 82 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029006; DOE/CS-30278/T7-Vol-5) Avail: NTIS HC A05/MF A01

The Solar Industrial Process Heat (SIPH) assessment is done to candidly examine the contribution SIPH is realistically able to make in the near and long-term energy futures of the United States. The performance history of government and privately funded SIPH demonstration projects and the present status of SIPH technology are discussed. Before making final recommendations, the influence of economic and socio-political factors (which have a very large effect on the acceptability and application of any new, aternate energy technology) are considered. Focus is on evacuated tube, parabolic trough, and multiple reflector solar collectors. Auxiliary equipment which is part of a SIPH system such as pumps, blowers, controls, and heat exchangers and storage (where applicable) are also discussed. DOE

N81-33645# Arizona Univ., Phoenix.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 6: PHOTOVOLTAIC TECHNOLOGY ASSESSMENT
Charles E. Backus Apr. 1981 41 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029007; DOE/CS-30278/T9-Vol-6) Avail: NTIS HC A03/MF A01

Industrial production of photovoltaic systems and volume of sales are reviewed. Low cost silicon production techniques are reviewed, including the Czochralski process, heat exchange method, edge defined film fed growth, dentritic web growth, and silicon on ceramic process. Semicrystalline silicon, amorphous silicon, and low cost poly-silicon are discussed as well as advanced materials and concentrator systems. Balance of system components beyond those needed to manufacture the solar panels are included. Nontechnical factors are assessed. The 1986 system cost goals are briefly reviewed. DOE

N81-33646# Hawaii Univ., Honolulu. Natural Energy Inst.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 7: A REVIEW OF OTEC
Paul C. Yuen Apr. 1981 150 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029008; DOE/CS-30278/T6-Vol-7) Avail: NTIS HC A07/MF A01

The Ocean Thermal Energy Conversion (OTEC) principle is discussed along with general system and cycle types, specific OTEC designs, applications, and the ocean thermal resource. The historic development and present status of OTEC are reviewed. Power system components of the more technically advanced closed-cycle OTEC concept are discussed: heat exchangers, corrosion and biofouling countermeasures, working fluids, ammonia power systems, and on-platform seawater systems. Several open-cycle features are also discussed. A critical review of the ocean engineering aspects of the OTEC power system is presented. Major subsystems such as platform, cold water pipe, mooring system, dynamic positioning system and power transmission cable system are assessed for their relationships with the ocean environment and with each other. Nine available studies of OTEC costs are reviewed, and tentative comparisons are made between OTEC and traditional fuel costs. Environmental and social effects of OTEC development and international and national laws regulating OTEC plants are reviewed. DOE

N81-33647# Houston Univ., Tex. Energy Lab.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 9: HELIOSTAT SYSTEMS: TECHNICAL AND ECONOMIC ASSESSMENT
A. F. Hildebrandt and C. L. Laurence Apr. 1981 92 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029010; DOE/CS-30278/T13-Vol-9) Avail: NTIS HC A05/MF A01

An extensive review of the literature is provided on heliostat central receiver systems including subsystem design and research experiments, full scale system designs, assessments, evaluations, rankings, application and marketing studies, and heliostat manufacturing studies. The current status of heliostat system development is reviewed and assessed. Recent design reports are examined, and expected economic and performance improvements are reported. Recommendations are made for the role that government can play in heliostat systems development, and for state and federal policies for development of solar commercialization and the formation of heating utilities. DOE

N81-33648# Georgia Inst. of Tech., Atlanta.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 10: SOLAR TECHNOLOGY ASSESSSMENT: BIOMASS
Albert P. Sheppard, Jerry L. Birchfield, and Jack M. Spurlock Apr. 1981 59 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30478)
(DE81-029011; DOE/CS-30278/T11-Vol-10) Avail: NTIS HC A04/MF 01

The technical status of various biomass fuels, and needed national action and research are summarized. Fuels discussed include biomass liquid fuels from agricultural feedstocks (alcohol), liquid fuels from cellulosic feedstocks, energy from wood, and nonwoody biomass converted to gaseous fuels. DOE

N81-33649# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 11: THE SOLAR INDUSTRY IN THE UNITED STATES: ITS STATUS AND PROSPECTS, 1981
John A. Clark Apr. 1981 47 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029030; DOE/CS-30278/T8-Vol-11) Avail: NTIS HC A03/MF A01

The energy production goals for the solar industry, and the industry's present status are described. Manufacturing and sales of low and medium temperature solar collectors from 1974 to 2000 are analyzed, and the HUD/DOE solar demonstration programs' relative merits are discussed. Certain characteristics of the conventional water heating industry are briefly described DOE

N81-33650# Western Sun, Portland, Oreg.
SOLAR TECHNOLOGY ASSESSMENT PROJECT. VOLUME 12: STATE AND COMMUNITY COMMERCIALIZATION ISSUES
Ronald D. Doctor and Janice Hamrin (Alliance for Renewable Energy, Sacramento, Calif.) Apr. 1981 57 p refs Prepared in cooperation with Florida Solar Energy Center, Cape Canaveral 12 Vol.
(Contract DE-FC02-79CS-30278)
(DE81-029087; DOE/CS-30278/T14-Vol-12) Avail: NTIS HC A04/MF A01

The need to overcome economic and institutional barriers and make the transition to using renewable energy sources is briefly explained, and advantages to implementation of solar technology on the state and local government levels are discussed. The role of government involvement is defined, and the gathering and dissemination of information are discussed. Consumer protection; reliability assurance; and redress for problems. Each

of these parts is discussed. Mandates, economic incentives, and subsidies are described and analyzed. DOE

N81-33651# Spectrolab, Inc., Sylmar, Calif.
CONCEPTUAL DESIGN AND SYSTEM ANALYSIS STUDY FOR A HYBRID SOLAR PHOTOVOLTAIC/SOLAR THERMAL ELECTRIC POWER SYSTEM. VOLUME 2: STUDY RESULTS
Final Report
Jul. 1981 242 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE81-026737; SAND-80-7014/2-Vol-2) Avail: NTIS HC A11/MF A01

A hybrid photovoltaic/solar thermal electric conversion system is described. Several types of hybrid systems, photovoltaic only systems, and solar thermal electric systems were compared in performance and cost. It is found that hybrid systems potentially competitive with photovoltaic only or solar thermal electric conversion systems. However, hybrid systems do not appear to have a significant advantage on a levelized cost per kilowatt hour basis. DOE

N81-33652# Spectrolab, Inc., Sylmar, Calif.
CONCEPTUAL DESIGN AND SYSTEM-ANALYSIS STUDY FOR A HYBRID SOLAR PHOTOVOLTAIC/SOLAR THERMAL ELECTRIC POWER SYSTEM. VOLUME 1: EXECUTIVE SUMMARY
Jul. 1981 59 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE81-026162; SAND-80-7014/1-Vol-1) Avail: NTIS HC A04/MF A01

Studies on hybrid photovoltaic/solar thermal electric conversion systems are summarized. Several types of hybrid systems, photovoltaic only systems, and solar thermal electric systems were compared on performance and cost. Hybrid systems are shown to be competitive with photovoltaic only or solar thermal electric conversion systems, however, hybrid systems do not appear to have a significant advantage on a levelized cost per kilowatt hour basis. DOE

N81-33653# Department of Energy, Washington, D. C.
PROGRESS AND FORECAST IN ELECTRIC-VEHICLE BATTERIES
W. H. Webster, Jr. and N. P. Yao 1980 9 p refs Presented at Intern. Congr. on Transportation, Dearborn, Mich., 15 Sep. 1980
(Contract W-31-109-eng-38)
(DE81-023833; CONF-800939-2) Avail: NTIS HC A02/MF A01

A battery development program for near term electric vehicles was undertaken. The program's overall objective is to develop commercially viable batteries for commuter vehicles and for vans and trucks. Three near term battery are discussed: improved lead acid, nickel/iron and nickel/zinc systems. Progress was made in improving the specific energy, specific power, and manufacturing processes of these three battery technologies. Emphasis is on reduction of manufacturing cost and enhancement of battery cycle life and reliability. The zinc chloride battery is the fourth near term battery. DOE

N81-33654# New Hampshire Univ., Durham. Dept. of Chemical Engineering.
CONTINUOUS TWO-STAGE SOLAR-GASIFICATION SYSTEM
V. K. Mathur, S. M. Lakshmanan, F. K. Manasse, V. Venkataramanan, and R. W. Breault 1980 20 p refs Presented at the AICHE 73rd Ann. Meeting, Chicago, 16-20 Nov. 1980 Submitted for publication
(Contract DE-AC02-79ET-21067)
(DE81-025019; CONF-801104-16) Avail: NTIS HC A02/MF A01

The use of solar themal energy has the potential to play an important role in the production of fuels and chemicals. A continuous two stage fluidized bed hybrid solar coal gasification system designed at the University of New Hampshire to produce synthesis gas from various feed stocks - coal, lignite and peak is discussed. Heat and material balance are presented. The experimental data obtained from this bench scale unit will be useful for the commercialization of this technology. Economics of commercial solar gasification plants weight reference to their size are discussed. A suitable capacity for a solar hybrid plant is estimated to be 1.45 x 10 to the 6th power cu cm (50 MM SCF) per day of SNG. DOE

N81-33655# Sandia Labs., Albuquerque, N. Mex. Battery Evaluation Lab.
TESTING BATTERIES FOR PHOTOVOLTAIC POWER SYSTEMS
A. E. Verardo, P. C. Butler, D. M. Bush, and D. W. Miller 1981 10 p refs Presented at the IECEC Conf., Atlanta, 9-21 Aug. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-0226C; CONF-810812-6) Avail: NTIS HC A02/MF A01

A battery evaluation laboratory was established to investigate the application of various battery technologies for energy storage in a photovoltaic power system. The evaluation laboratory provides a controlled test environment in which batteries can be exposed to any one or all of the following: (1) long term performance testing; (2) accelerated life testing; (3) simulated photovoltaic power system operational testing. Several battery systems are being tested. A description is presented of the laboratory and the tests currently being conducted and a brief description of the battery systems under test. DOE

N81-33656# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PERFORMANCE OF SODIUM-BETA ALUMINA SOLID ELECTROLYTE IN Na/S CELLS
Lutgard C. DeJonghe May 1981 5 p refs Presented at the IECEC Conf., Atlanta, 9-21 Aug. 1981
(Contract W-7405-eng-48)
(DE81-023030; LBL-12657; CONF-810812-18) Avail: NTIS HC A02/MF A01

Two different modes of degradation in the performance of sodium beta alumina type solid electrolytes are discussed. Mode 1 focuses on a pre-existing surface flaw; mode 2 involves internal sodium precipitation and possible microfracture. The second mode can be activated when a gradient in transport number ratios is created by chemical reduction of the electrolyte by the sodium electrode. The implications of the degradation for cell operation are discussed. DOE

N81-33657# Maurer Engineering, Inc., Houston, Tex.
EVALUATION OF EQUIPMENT AND METHODS TO MAP LOST CIRCULATION ZONES IN GEOTHERMAL WELLS
William J. McDonald, Patrick A. Leon, and Gerard Pittard May 1981 208 p refs Prepared for Sandia National Labs.
(Contract DE-AC04-76DP-00789)
(DE81-769405; SAND-80-7057) Avail: NTIS HC A10/MF A01

Methods to locate, characterize, and quantify lost circulation zones are studied. Twenty-five methods of mapping and quantifying lost circulation zones were evaluated, including electrical, acoustical, mechanical, radioactive, and optical systems. The structured, numerical evaluation plan, used as the basis for comparing the 25 tools, and the resulting among the tools is presented. DOE

N81-33658# Pacific Sun, Inc., Palo Alto, Calif.
OAKMEAD SOLAR BUILDINGS
Mar. 1981 161 p refs
(Contract DE-FC03-77CS-31521)
(DOE/CS-31521/T1) Avail: NTIS HC A08/MF A01

Twin 50,000 square feet industrial buildings, incorporating both active and passive solar design features, in the Oakmead Industrial Park, Santa Clara, California, employ slab floor construction and tilt-up concrete walls. A structural facia on the north extreme of each building provides a 45 deg support for approximately 2900 square feet of high-performance flat plate collectors. These liquid-based collectors form the basis for an active solar subsystem which includes a unique control logic to manage energy in a Second Law sense. The south-facing, vertical tilt-up concrete wall has been modified to accommodate some 1200 square feet of air-based collector fashioned after a Trombe

design. The tilt-up wall fabrication technique is commonly used in commercial and industrial building construction, and shows promise for ready adaptation to passive solar heating applications. The combined active and passive subsystems were designed to provide approximately 90% of the annual energy requirements for heating and hot water. DOE

N81-33659# California Univ., Berkeley. Lawrence Berkeley Lab.
PRELIMINARY EVALUATION OF IMPINGEMENT AND ENTRAINMENT BY OCEAN THERMAL ENERGY CONVERSION (OTEC) PLANTS
S. M. Sullivan and M. D. Sands Aug. 1980 16 p refs Presented at 7th Ocean Energy Conf., Washington, D.C., 2 Jun. 1980
(Contract W-7405-eng-48)
(DE81-023046; LBL-11833; CONF-800633-5) Avail: NTIS HC A02/MF A01

The ocean thermal energy conversion (OTEC) environmental assessment program, which the historical data from the candidate OTEC resource areas were examined. The effects of OTEC impingement and entrainment were assessed. It is suggested that the OTEC site characterization is completed when the available information is insufficient to assess the effects of an OTEC plant. DOE

N81-33660# Schumacher (J. C.) Co., Oceanside, Calif.
LOW-COST-SILICON-PROCESS DEVELOPMENT. PHASE 4: PROCESS IMPROVEMENT Quarterly Technical Progress Report
R. V. Giraudi and C. G. Newman Apr. 1981 62 p refs
(Contract DE-AC02-77CH-00178)
(DE81-769623; SERI/PR-8279-1-T2; QTPR-2) Avail: NTIS HC A04/MF A01

During this period process improvement studies continued in the mini-plant, focusing on the correlation of current mini-plant yield results with prior laboratory scale work. Silicon bromination in the synthesis unit and tribromosilane purification in the distillation unit proceeded efficiently and without complication. Tribomosilane yields in the synthesis unit were low due to unobtainable higher reaction temperatures. Initial polycrystalline silicon production studies indicate consistent yields of 85%. The laboratory scale static bulk reactor system was calibrated by observing the decomposition of t-butyl chloride. A free space reactor apparatus was assembled and tribromosilane decompositions, as a function of dilution in argon, was studied. DOE

N81-33661# Norske Veritas, Oslo. Industrial and Offshore Div.
OTEC PILOT PLANT: REQUIREMENTS TO DESIGN FABRICATION INSPECTION, MAINTENANCE AND REPAIR OF HULL CWP AND SKSS
S. Fjeld, K. Stokke, G. Foss, and J. Malmo 13 Feb. 1981 140 p refs
(Contract DE-AI01-79CS-20396)
(DE81-024914; DOE/NOAA/OTEC-38) Avail: NTIS HC A07/MF A01

The applicability of national and proprietary regulations and codes for the design and construction of the OTEC pilot plant was investigated. Main characteristics considered in this study are the unique water depths, dimensions and purpose of the OTEC plant. On the basis of this study minimum technical specifications for the OTEC hull, CWP and SKSS were suggested. T.M.

N81-33662# Kraftanlagen A.G., Heidelberg (West Germany).
DOMESTIC WATER HEATING BY SOLAR ENERGY Final Report
Friedrich Reinmuth Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 37 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-062; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

A solar hot water plant was equipped with extensive measuring instrumentation. The main results of tests carried out during 1 year, are: the average collector efficiency during 1 year operation is 15.9%; the total collector area of 30 sqm (23 sqm oriented to the south-west and 7 sqm to the south-east) produces 3.9 MWhr useful heat in 12 months; the climatic data of the test year (Sun radiation and outside temperatures) approximately agree with multiyear average data from the German weather bureau); and the 30 sqm collector plant only supplies 16% of the total yearly heat demand of the new dwelling of 150 sqm useful area (for space and hot water heating). Author (ESA)

N81-33663# Bergbau-Forschung G.m.b.H., Essen (West Germany).
INVESTIGATION OF THE USE OF COAL WASTE AS RAW MATERIAL FOR THE PRODUCTION OF ALUMINUM Final Report
Lothar Kuehn, Theodor Schieder, Milan Belsky (Vereinigte Aluminium-Werke AG), Juergen Lotze (Vereinigte Aluminium-Werke AG), and Guenter Winkhaus (Vereinigte Aluminium-Werke AG) Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-112; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

Coal wastes, containing on the average 25% Al_2O_3, represent an important domestic raw material potential for the aluminium industry. Reliable data on the occurrence and composition of wastes from major coal mining areas in the Federal Republic of Germany were collected. The behavior of wastes during extraction with acids was investigated. Possible uses of residual silica are outlined. There exist basic process concepts for the extraction of alumina from the wastes, using experience in the processing of kaolinite. However, transfer to a technical scale requires several years of further development. Author (ESA)

N81-33664# Accumulation-Fabrik A.G., Soest (West Germany). Zentrallab.
BIPOLAR LEAD ACCUMULATOR CELL WITH HIGH ENERGY DENSITY Final Report
Reiner Kiessling Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 109 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-115; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,90

In order to increase the energy density, a cellular design using light weight bipolar electrodes was studied. The reduced water consumption lowers the requirements on maintenance. The negative electrode is made of lead-plated copper. An 80 to 100 micron protecting layer of lead is sufficient because there is no anodic corrosion. Copper itself, in contact with negative active material, remains stable within the range of the usual electrochemical potentials. The alumin positive electrode requires a protecting lead layer of at least 250 microns, without pinholes or other defects, against anodic corrosion. Author (ESA)

N81-33665# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.
DEVELOPMENT OF COMPONENTS FOR THE SOLAR HEATING CIRCUIT Final Report
Manfred Moeller Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-154; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,65

An aluminum/manganese/zirconium alloy suitable for the roll-bond method was developed and a process for the manufacture of solar absorbers on the basis of this material is described. Correctly adjusted inhibited glycol-water mixtures and synthetic heat transfer fluids proved their value for solar installations with aluminum components. The pH-value and the efficiency of the inhibitors of glycol-water mixtures must be regularly controlled. If synthetic heat transfer fluids are used, care should be taken that they, and also the installation, are free from water in order to avoid corrosion damage. With the present status of technol-

ogy, water to which inhibitors or inhibitor mixtures are added, is not suited for this purpose. Author (ESA)

N81-33666# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Neue Technologie.
QUALIFICATION OF THE M. A. N. SOLAR FARM MODULE TYPE 3/32 AS PART OF A DEMONSTRATION PROGRAM Final Report
Karl Wildenrotter Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 46 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-162; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

The structure, the collectors, the driving and piping systems were optimized. A special electronic tracking system was developed. Critical components were tested and qualified. Mechanical and thermal tests of the complete module were conducted. The applicability of alternative mirror elements was studied. Improvements in the construction allow for higher efficiency and a reduction in production costs of 17%. The installed driving power was reduced from 430 to 203 W and the module weight from 2500 to 1900 kg. Author (ESA)

N81-33667# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Neue Technologie.
FINAL PLANS FOR THE CONSTRUCTION OF GROWIAN Final Report
Friedrich Koerber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 89 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-171; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

A large scale wind energy converter, GROWIAN, with an installed electrical power of 3 MW was designed. The horizontal axis wind turbine employs a two blade rotor with teetered hub in downwind position. Electricity produced is fed directly into the grid. Power regulation is provided by electrically activated pitch variation. A planetary gear transfers rotation to a variable speed generator with a frequency controlled output to the grid. The nacelle and rotor are mounted on the ground and lifted on top of the tower by an internal hoist. Author (ESA)

N81-33668# Technical Research Centre of Finland, Helsinki. Fuel and Lubricant Research Lab.
SIMULTANEOUS THERMAL ANALYSIS OF SOLID FUELS
Jussi Ranta and Timo Nyroenen Jul. 1980 87 p refs In FINNISH; ENGLISH summary
(VTT-34; ISBN-951-38-1125-2; ISSN-0355-3590) Avail: NTIS HC A05/MF A01

Different solid fuels, coal, woods, peat grades, and by-products, and organic wastes were studied by thermoanalysis. An atlas for thermal analyses was prepared which compares the different fuel properties. Thermal gravimetry curves derivate thermal gravimetry curves (combustion rate), differential thermal analysis curves, and gas analysis curves. The method enables calculations of ignition temperatures, combustion rates, reaction related temperatures, temperatures of evolving gases, reaction rates, action energies, and frequency factors. Author (ESA)

N81-33669# Illinois Inst. of Natural Resources, Springfield.
ILLINOIS RESIDENTIAL ENERGY EFFICIENCY INDEX
Walter Zyznieuski Jan. 1981 28 p refs
(Contract DE-F646-80CS-69095)
(PB81-211021; ILLDOE-81S/02) Avail: NTIS HC A03/MF A01 CSCL 10A

The index (EEI) measures the amount of natural gas and electricity used for heating in Illinois homes during a four year period (1976-1980). The four year EEI results based on data received from the utilities involved in the study were reviewed. GRA

N81-33670# Illinois Inst. of Natural Resources, Springfield.
ILLINOIS ENERGY PLAN: STAFF WORKING PAPER. VOLUME 1: ILLINOIS ENERGY CONSUMPTION TRENDS, 1960-2000
May 1981 297 p refs
(PB81-211245; ILLDOE-81S/13-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 10A

An analysis of historical state energy consumption patterns for five different economic sectors: residential, transportation, commercial, agricultural and industrial is presented. Future energy consumption and costs in Illinois are projected. GRA

N81-33671# Charles River Associates, Inc., Boston, Mass.
ENERGY REQUIREMENTS FOR METALS PRODUCTION: COMPARISON BETWEEN OCEAN NODULES AND LAND-BASED RESOURCES Final Report
Sep. 1980 100 p refs
(PB81-211351; NOAA-81040602; CRA-492) Avail: NTIS HC A05/MF A01 CSCL 10A

The energy requirements for production of copper, nickel, cobalt, and manganese from ocean nodules are based on an ocean mining operation of 3 million tons per year of dry nodules. A linear relationship exists between the amount of nodules processed and the total energy so that the energy can be easily converted to other processing rates if desired. GRA

N81-33672# Thermo Electron Corp., Waltham, Mass.
THE DEVELOPMENT OF SOLAR-ASSISTED GAS-FIRED APPLIANCES Final Report, Phase 1
Kenneth G. Hagen 12 Sep. 1980 161 p refs
(Contract GRI-5014-343-0189)
(PB81-217606; TE-4274-69-81; GRI-79/0098) Avail: NTIS HC A08/MF A01 CSCL 10A

The application of solar assistance to gas-fired appliances other than space and water heating systems was accomplished for the residential and commercial sectors. This included an assessment of the energy use characteristics of residential and commercial appliances and the relationship to solar availability. Selected applications indicate a higher likelihood of early commercial viability than can be expected with active solar space heating and cooling systems. High solar utilization and system simplicity can be combined with certain appliance applications. GRA

N81-33673# Illinois Inst. of Natural Resources, Springfield. Resources Development Div.
PROJECT SUMMARIES OF THE ILLINOIS LOW-COST SOLAR ENERGY DEMONSTRATION GRANT PROGRAM 1980
Allen Elrod Jul. 1980 26 p
(PB81-210577; ILLDOE-80/21) Avail: NTIS HC A03/MF A01 CSCL 13A

Funding for each project is part of the grant program conducted by the Illinois Institute of Natural Resources. Local governments and community organizations trained local labor in low-cost solar technology and built either a solar greenhouse, vertical wall collectors, or window box collectors as demonstration projects to low-income neighborhoods. The report highlights each project and provides contact persons for further details. GRA

N81-33674# Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
GEOTHERMAL ENERGY DEVELOPMENT IN THE EASTERN UNITED STATES. TECHNICAL ASSISTANCE REPORT NO. 6, GEOTHERMAL SPACE HEATING AND CONDITIONING: MCGUIRE AIR FORCE BASE, NEW JERSEY
F. K. Hill and R. vonBriesen 30 Dec. 1980 44 p refs
(Contracts DE-AI01-79ET-27025; EX-76-A-36-1008)
(PB81-212375; JHU/APL/QM-80-190) Avail: NTIS HC A03/MF A01 CSCL 13A

The feasibility of space heating and cooling 200 multifamily on-base housing units using nonreversible heat pumps and ground water from 1000 ft. depth was studied. The 200 housing units are a part of the 1452 main base multifamily housing complex which is heated from a high temperature and pressure water line. The main system will be converted from natural gas to coal in 1984. Relative cost, amortization periods, and fossil fuel projections are compared. GRA

N81-33675# National Bureau of Standards, Washington, D.C.
USE OF FCHART VERSION 3.0 TO PREDICT AUXILARY

ENERGY USE IN RESIDENTIAL SOLAR ENERGY SYSTEMS
John B. Carlock, III May 1981 107 p refs Sponsored in part by HUD
(Contract NBS-78-3534)
(PB81-217010; NBS/GCR-81-321; Rept-192) Avail: NTIS HC A06/MF A01 CSCL 13A

Thermal performance predictions for five residential buildings with solar space heating and hot water systems using the FCHART computer program were compared with measured thermal performance data from each site. The FCHART calculations are based on measured meteorological data and on space heating loads that are both measured and calculated using building thermal envelope data and the modified degree day method. GRA

N81-33676# National Bureau of Standards, Washington, D.C. Building Equipment Div.
CONTROL STRATEGIES FOR ENERGY CONSERVATION. A CASE STUDY OF THE MATERIALS BUILDING, NATIONAL BUREAU OF STANDARDS Final Report
James Y. Kao and E. Thomas Pierce Jun. 1981 48 p refs
(PB81-217804; NBSIR-81-2277) Avail: NTIS HC A03/MF A01 CSCL 13A

The BLAST-2 computer program was used to investigate various heating, ventilating and air conditioning control strategies and their combinations to reduce the energy consumption of a laboratory building. The techniques of modeling the building load and air system performance are explained. The results are presented and discussed. Control strategies investigated include dry-bulb and enthalpy economizer cycles, resetting supply air tempratures by outside temperature and zone demand, shutdown of fan systems selectively, and converting interior systems to VAV systems. By combining the various control strategies, eight percent, twenty-nine percent and eight percent of heating, cooling and fan energy respectively may be saved. GRA

N81-33677# National Bureau of Standards, Washington, D.C.
RESEARCH AND INNOVATION IN THE BUILDING REGULATORY PROCESS: PROCEEDINGS OF THE 5TH ANNUAL NBS/NCSBCS JOINT CONFERENCE. TECHNICAL SEMINAR ON SOLAR ENERGY CONSERVATION Final Report
Sandra A. Berry May 1981 211 p refs Proc. held at Denver, 6 Aug. 1980
(PB81-219321; NBS/SP-608) Avail: NTIS HC A10/MF A01 CSCL 13A

Topics in solar energy and energy conservation are addressed. These proceedings include: (1) energy programs in the state of Colorado; (2) building energy performance standards concepts (3) state energy audits; (4) energy and building systems services; (5) solar energy and building codes. GRA

N81-33332# Stuttgart Univ. (West Germany).
SAAR: TRANSPORT SYSTEM FOR DISTRICT HEATING [FERNWAERMESCHIENE SAAR]
W. Hochreuther (Saarberg-Fernwaerme GmbH., Saarbruecken, West Germany) *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 221-250 In GERMAN (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N81-33678*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A CATALOG OF SOCIAL SURVEYS OF RESIDENTS' REACTIONS TO ENVIRONMENTAL NOISE, 1943 - 1980
James M. Fields Aug. 1981 178 p
(NASA-TM-83187) Avail: NTIS HC A09/MF A01 CSCL 13B

Two hundred social surveys of people's responses to environmental noise in residential areas are briefly described. The surveys are indexed by country, noise source and date of survey. The publications and reports about each survey are listed in a bibliography. Recent English translations of 14 publications are listed separately. Nineteen surveys are listed which are available for secondary analysis from a data archive. E.A.K.

N81-33679*# Research Triangle Inst., Research Triangle Park, N. C. Systems and Management Div.
IN SITU SENSORS FOR MEASUREMENTS IN THE GLOBAL TROSPOSPHERE Final Report
M. L. Saeger, W. C. Eaton, R. S. Wright, J. H. White, and J. B. Tommerdahl Washington NASA Sep. 1981 274 p refs
(Contract NAS1-15827)
(NASA-CR-3465; RTI/1816/4) Avail: NTIS HC A12/MF A01 CSCL 13B

Current techniques available for the in situ measurement of ambient trace gas species, particulate composition, and particulate size distribution are reviewed. The operational specifications of the various techniques are described. Most of the techniques described are those that have been used in airborne applications or show promise of being adaptable to airborne applications. Some of the instruments described are specialty items that are not commercially-available. In situ measurement techniques for several meteorological parameters important in the study of the distribution and transport of ambient air pollutants are discussed. Some remote measurement techniques for meteorological parameters are also discussed. State-of-the-art measurement capabilities are compared with a list of capabilities and specifications desired by NASA for ambient measurements in the global troposphere. J.D.H.

N81-33680# Battelle Pacific Northwest Labs., Richland, Wash.
EVALUATION OF FLYASH SURFACE PHENOMENA AND THE APPLICATION OF SURFACE ANALYSIS TECHNOLOGY, PHASE 1 Summary Report
R. D. Smith Jun. 1981 66 p refs
(Contract DE-AC06-76RL-01830)
(DE81-029106; PNL-3842) Avail: NTIS HC A04/MF A01

The factors governing the formation of flyash surfaces during and following coal combustion were reviewed. The competing chemical and physical processes during the evolution of inorganic material in coal during combustion into flyash are described with respect to various surface segregation processes. Two mechanisms leading to surface enrichment are volatilization-condensation processes and diffusion processes within individual flyash particles. The experimental evidence for each of these processes was reviewed. It is shown that the volatilization-condensation process is the major factor leading to trace element enrichment in smaller flyash particles. DOE

N81-33681# Department of Energy, Washington, D. C.
ENVIRONMENTAL TRENDS TO THE YEAR 2000
Jul. 1981 23 p refs
(DE81-027695; DOE/EP-0021) Avail: NTIS HC A02/MF A01

This analysis focuses on the environmental impacts of the National Energy Policy Plan and emphasizes those pollutants for which energy development and use play a significant role. The increase in relative contributions of the energy sector to emissions during the study period is within a range of zero to 15% for all selected pollutants with the exception of ash, captured particulates, and oil-shale waste. For the group, the energy sector contribution increases from 58% to 89%, primarily because of the production of oil from shale. If the oil-shale wastes were not included in these totals, energy-process wastes would be 62% of the national total of 250 million tons. Even though these figures represent total net emissions to the environment, rather than ambient concentrations, the assessment offers a sound basis for an important overall conclusion. The significant economic growth projected by the National Energy Policy Plan, and continuing free-market efforts to ensure the wise and efficient application of energy resources by the nation, can be achieved without foresaking reasonable environmental quality. DOE

N81-33682# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK
Jul. 1981 176 p Sponsored in part by ANL

(Contract DE-AC01-79CS-30027)
(DE81-028176; SOLAR/0010-81/07) Avail: NTIS HC A09/MF A01

Environmental information was collected and tabulated for different solar sites. The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the solar site. The ratio of total extraterrestrial radiation as a percent is shown. The average, daytime, nighttime, maximum, minimum and inlet water temperatures for the solar site are recorded. Wind sensors provide information for two wind tables furnishing wind speed and direction. A humidity table provides relative humidity values for day and night and gives values for the maximum and minimum humidity for each day. DOE

N81-33683# Rockwell International Corp., Golden, Colo. Dept. of Chemistry Research and Development.
PURIFICATION AND DECONTAMINATION OF A CAUSTIC WATER BY REVERSE OSMOSIS
Carl E. Plock and Terry N. Tavis 28 Jul. 1981 5 p refs
(Contract DE-AC04-76DP-03533)
(DE81-027720; RFP-3103) Avail: NTIS HC A02/MF A01

A reverse osmosis pilot plant was used to decontaminate a caustic water containing low concentrations of uranium, plutonium and americium. The concentrations of the plutonium and americium were less than one picocurie per liter in the product water. The concentrations of the uranium was reduced to 4.4 picocuries per liter in the product water, which is a reduction of greater than 99%. The reverse osmosis pilot plant was operated at a 98% water recovery, which produced 25,000 gallons per day of product water. DOE

N81-33684# Sandia Labs., Albuquerque, N. Mex. Environmental Research Div. 4533
PROJECT DAVINCI: A STUDY OF LONG-RANGE AIR POLLUTION USING A BALLOON-BORNE LAGRANGIAN MEASUREMENT PLATFORM. VOLUME 2: REPORTS OF PARTICIPANTS IN DA VINCI 1 Final Report
B. D. Zak, ed., R. M. Holland, Jr., ed. (AnaChem, Inc.), P. S. Homann, ed. (AnaChem, Inc.), and K. M. Jackson, ed. (AnaChem, Inc.) May 1981 144 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028186; SAND-78-0403/2) Avail: NTIS HC A07/MF A01

Long range air pollution which is important for the development of cost effective air quality control strategies is discussed. Project Da Vinci is an effort to address the need to study long range air pollution. It consisted of a series of three instrumented, manned balloon flights to study the lower atmosphere in a Lagrangian frame of reference. Information on gases and aerosols, radiation, electrical fields, atmospheric structure turbulence, diffusion, mesoscale motions, and their interrelationship was collected. DOE

N81-33685# Argonne National Lab., Ill.
SAMPLING AND ANALYSIS OF HYDROCARBONS IN COMBUSTION GASES Quarterly Report, Oct. - Dec. 1980
I. Johnson, K. M. Myles, A. A. Siczek, and D. C. Fee Jun. 1981 25 p refs
(Contract W-31-109-eng-38)
(DE81-028478; ANL/CEN/FE-80-22) Avail: NTIS HC A02/MF A01

A methodology for the chemical analysis of ultratrace levels of polycyclic organic compounds in the flue gases from fluidized bed combustors was developed. The chemical analysis of polycyclic aromatic hydrocarbons (PaHs) present in stack emissions at ultratrace levels is described. Three distinct areas in the measurement of organic matter at such trace levels are: sample collection, sample recovery, and sample analysis. Methods for sample collection from the stack such as filters and polymer sorbents are described. DOE

N81-33686# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
ADVANCED PULVERIZED-COAL COMBUSTOR FOR CONTROL OF NO/SUB X/ EMISSIONS Quarterly Report, 1 Apr. - 30 Jun. 1981
R. L. Pam, S. T. Suttmann, J. T. Kelly, and E. K. Chu 31 Jul. 1981 20 p
(Contract DE-AC22-80PC-30296)
(DE81-029124; DOE/PC-30296/T1; QR-3) Avail: NTIS HC A02/MF A01

A dimensional combustor, incorporating fuel staging for control of NO/sub x emissions was examined. A comprehensive computer model is developed to allow NO mechanisms and rates to be extracted from the experimental data. Initial PROF code runs led to extensive debugging efforts. A simplified radiation model formulation and devolatization model are described. Combustor installation was completed. Work utilizing fuel staging concepts is summarized in terms of its NO/sub x/ reduction potential. DOE

N81-33687# Ames Lab., Iowa.
ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF POWER PLANT FLY ASH
M. J. Murtha 1980 17 p refs Presented at 3rd Miami Intern. Conf. on Alternative Energy Sources, Bal Harbour, Fla., 15-17 Dec. 1980
(Contract W-7405-eng-82)
(DE81-023777; IS-M-309; CONF-801210-28) Avail: NTIS HC A02/MF A01

The environmental impact of coal combustion and fly ash disposal, the current status of relevant legislation and regulations, and ash utilization process development are discussed. A process being developed for metals recovery from fly ash is described. DOE

N81-33688# Virginia Highway and Transportation Research Council, Charlottesville.
STATE OF THE ART OF STREAM MONITORING Final Report, Jun. 1980 - Mar. 1981
James C. Pickral Mar. 1981 57 p refs Sponsored in part by Virginia Dept. of Highways and Transportation
(HPR Proj. 1676)
(PB81-208993; FHWA/VA-81/34; VHTRC-81-R34) Avail: NTIS HC A04/MF A01 CSCL 07D

A literature search was undertaken to determine the present knowledge of the effects of excess sediment on aquatic ecosystems and to investigate possible ways to monitor the impact of sediments in stream biota. Interviews were held with state and federal agencies involved with sediment pollution to determine the nature and extent of their programs, especially with regard to stream monitoring. The results of the literature search and the agency interviews indicate that the department could sample process, and analyze stream bottom samples more efficiently and quantitatively than at present. Information obtained from the literature suggests that the analysis of stream bottom sediments could be used to assess sediment pollution. GRA

N81-33689# Maine Univ. at Orono. Land and Water Resources Center.
ANALYSIS, DISTRIBUTION, AND INTERACTIONS OF CHROMIUM IN THE AQUATIC ENVIRONMENT
Lawrence M. Mayer, Linda L. Schick, Patrice M. Rossi, Howard H. Patterson, and C. Allen Chang Apr. 1981 66 p refs Sponsored by OWRT
(PB81-212300; W81-03367; OWRT-B-016-ME(4)) Avail: NTIS HC A04/MF A01 CSCL 07D

The combination of substantial chromium (Cr) pollution in parts of Maine and general lack of knowledge about its likely environmental cycling was studied. Accumulation of Cr in Saco River sediments was found in patterns controlled by hydrography and grain size. Pollutant impact assessment was made by textural normalization using sediment specific surface areas. Oxidation of dissolved/particulate CR(III) was not likely in the Saco estuary; and effluent dissolved CR(III) is not likely retained, but rather flushed out to sea, bound to iron humic colloids. The Cr(HI) sediment adsorption decreased with increasing salinity. Chemiluminescent analysis sensitivity of free aqueous Cr(III) was enhanced by added halides, making application of this technique to seawater Cr analysis. GRA

N81-33690# North Carolina Water Resources Research Inst., Raleigh.
STREAM MONITORING FOR HEAVY METALS BY ANALYSIS

OF AQUATIC INSECT LARVAE
Charles M. Weiss, Richard P. Maas, and Steven A. Dressing Jan. 1981 158 p refs
(Contract DI-14-34-0001-8035)
(PB81-209082; W81-03258; OWRT-A-095-NC(3)) Avail: NTIS HC A08/MF A01 CSCL 06T

The potential of aquatic insects for monitoring heavy metals in streams and rivers was investigated. The caddisfly, Hydropsyche sp. and the midgefly, Chironomus sp., were exposed to a wide range of aqueous cadmium, chromium and zinc concentration. The rates of accumulation and loss of the test metals and the equilibrium metal concentrations in the test species were determined. The effects were also evaluated. Chironomus sp. accumulated all three metals to a greater extent than Hydropsyche sp. Equilibrium organism metal concentrations increased with increasing water temperature for a given aqueous metal concentration. The rate of metal release following transfer of exposed organisms to metal free water was significantly slower for Hydropsyche sp. GRA

N81-33691# Battelle Columbus Labs., Ohio.
CONTROL OF EMISSIONS FROM RESIDENTIAL WOOD BURNING BY COMBUSTION MODIFICATION
John M. Allen and W. Marcus Cooke May 1981 100 p refs
(Contract EPA-68-02-2686)
(PB81-217655; EPA-600/7-81-091) Avail: NTIS HC A05/MF A01 CSCL 13B

Three commercial appliances were operated with both normal and modified designs, providing different burning modes: updraft with a grate, updraft with a hearth, crossdraft, downdraft, and a high-turbulence mode utilizing a forced-draft blower. Fuels were naturally dried commercial oak cordwood, commercial green pine cordwood, ovendried fir brands, and naturally dried oak cut into reproducable triangles. Several combustion modification techniques were identified which have an appreciable effect on emission factors and include: prevention of heating the inventory of wood within the stove but not yet actively burning, focusing the air supply into the primary burning area with high turbulence, and increasing the temperatures in the secondary burning regions of the appliances. GRA

N81-33692# Environmental Protection Agency, Ann Arbor, Mich. Inspection and Maintenance Staff.
RECOMMENDATIONS REGARDING THE SELECTION OF IDLE EMISSION CUTPOINTS FOR INSPECTION AND MAINTENANCE PROGRAMS REQUIRING ONLY CARBON MONOXIDE EMISSION REDUCTIONS
Susan Vintilla May 1981 15 p refs
(PB81-215444; EPA-AA-IMS-81-13) Avail: NTIS HC A02/MF A01 CSCL 13F

This report is intended to aid I/M programs which only require CO reductions in the prediction of failure rates, and estimation of I/M emission benefits. Its recommendations are applicable to I/M in areas that have already attained the ozone standard or that are projected to attain the ozone standard by 1982 without I/M. GRA

N81-33693# Environmental Protection Agency, Research Triangle Park, N.C. Control Programs Development Div.
PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1978 Annual Report
1980 65 p refs
(PB81-210189) Avail: NTIS HC A04/MF A01 CSCL 13B

Section 313 of the Clean Air Act requires the EPA administrator to report yearly on measures taken toward implementing the purpose and intent of the Act. This report also includes several other reports to Congress required under the Clean Air Act as amended: Section 202 report on measures taken in relation to motor vehicle emission control; and Section 306 (e) report on Federal procurement and violating facilities. GRA

N81-33694# Environmental Protection Agency, Research Triangle Park, N.C. Control Programs Development Div.
PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1977 Annual Report
1980 117 p refs
(PB81-210197) Avail: NTIS HC A06/MF A01 CSCL 13B

The Clean Air Act requires reports on measures taken toward implementing the Act. This report describes the issues involved in the prevention and control of air pollution. Two other EPA reports are included. A report on measures taken in relation to motor vehicle emission control and a report on Federal procurement and violating facilities. GRA

N81-33695# Environmental Protection Agency, Research Triangle Park, N.C.
PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1976 Annual Report
1980 158 p refs
(PB81-210205) Avail: NTIS HC A08/MF A01 CSCL 13B

The issues involved in the prevention and control of air pollution and the major elements of progress toward that goal are reported. Measures taken in relation to motor vehicle emission control and a report on Federal procurement and violating facilities are presented. GRA

N81-33696# Illinois Univ., Chicago. School of Public Health.
CHARACTERIZATION OF AIR POLLUTANTS FROM AN ACTIVATED SLUDGE PROCESS
Peter A. Scheff, Janet A. Holden, and Richard A. Wadden Feb. 1981 11 p refs
(Grant EPA-R-805003)
(PB81-212227; EPA-600/J-81-172) Avail: NTIS HC A02/MF A01 CSCL 13B

The activated sludge process is a common and useful method for treating wastewater. However, because of the necessity for aerating the sludge, the potential exists for release of a variety of viable and nonviable pollutants to the ambient atmosphere. Based on measurements made at a waste treatment plant, the significant source of TVP (total viable particles) and total coliforms. Atmospheric TVP concentrations were elevated above background out to 1.6 km. Levels for total coliforms were reduced to background at less than 0.8 km, probably reflecting the limited viability of these bacteria in air. GRA

N81-33697# PEDCo-Environmental, Inc., Kansas City, Mo.
IDENTIFICATION OF SOURCES OF PARTICULATES FOR ST. JOSEPH, MISSOURI Final Report
Feb. 1981 162 p refs
(Contract EPA-68-02-3173)
(PB81-212573; EPA-907/9-81-003) Avail: NTIS HC A08/MF A01 CSCL 13B

Identification of particulate sources to develop particulate control measures is described. Five techniques were used: (1) statistical analyses of historic particulate sampling data; (2) microinventories around sampling sites and evaluation with the empirical modeling technique; (3) short term particulate sampling at additional locations; (4) chemical and microscopic evaluations of particulate samples; and (5) evaluation of major point sources. It is indicated that 24 to 35% of the particulate concentration at urban sites is generated by St. Joseph area sources as opposed to extra-regional sources. GRA

N81-33698# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
ENAMAP-1(EASTERN NORTH AMERICAN MODEL OF AIR POLLUTION) LONG TERM SO2 AND SULFATE POLLUTION MODEL: FURTHER APPLICATION TO EASTERN NORTH AMERICA Final Report, Feb. - Aug. 1980
C. M. Bhumralkar, R. L. Mancuso, D. E. Wolf, K. C. Nitz, and W. B. Johnson Jun. 1981 128 p refs
(Contract EPA-68-02-2959; SRI Proj. 7760)
(PB81-213217; EPA-600/7-81-102) Avail: NTIS HC A07/MF A01 CSCL 13B

The eastern North American model of air pollution (ENAMAP-1), a regional trajectory type model that is an adapted version of the European Model of Air Pollution (EURMAP-1) was tested. The ENAMAP-1 model calculations were based on all available wind and precipitation data and on specialized emission data prepared for the sulfate regional experiment (SURE) program. The ENAMAP-1 model was tested to determine the variability of the model's seasonal calculations caused by year to year changes in wind and precipitation patterns. Results are in agreement with the available air quality measurements. The effects of yearly variations in the transport winds were most noticeable in the monthly SO4 concentration patterns and in the SO4 wet

deposition fields; the latter also showed strong sensitivity to yearly variations in precipitation. GRA

N81-33699# North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
APPLICATION OF ADVANCED TECHNOLOGY FOR POTABLE WATER SUPPLIES IN NORTH CAROLINA
Gerald E. Speitel, Jr. 1981 182 p refs
(Contract DI-14-34-0001-9035)
(PB81-212359; W81-03364; OWRT-A-109-NC(1)) Avail: NTIS HC A09/MF A01 CSCL 13B

Five European water treatment techniques are identified as having a definite potential for application in the United States: ozone, chlorine dioxide, granular activated carbon, biological activated carbon and dissolved air floatation. Osone is an attractive alternative to chlorine as a primary disinfectant. It may also be useful for pretreatment purposes, trihalomethane precursor removal and overall organics oxidation. Cost considerations and a very short lived residual are responsible for the limited use of ozone in the United States. Chlorine dioxide is well suited for use both in pretreatment and post-treatment to provide a distribution system residual. GRA

N81-33700# Wisconsin Univ. - Madison. Dept. of Geology and Geophysics.
SOURCES OF CHLORIDE AND SULFATE IN GROUNDWATER BENEATH AN URBANIZED AREA IN SOUTHWESTERN WISCONSIN
Steven B. Gelb and Mary P. Anderson 1981 44 p refs
(Contract DI-14-34-0001-0153)
(PB81-212391; WIS-WRC-81-01; W81-03365; OWRT-A-083-WIS(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

Groundwater levels and quality were monitored in the Menomonee River Watershed in southeastern Wisconsin from November 1979 to June 1980. Surface water quality was monitored at nine river locations. Results confirmed the findings of a reconnaissance investigation during 1976-77 that chloride and sulfate occur in high concentrations in groundwater in this area. However, there appeared to be a trend towards improved groundwater quality from 1976 to 1980, demonstrated by decreases in concentrations of sulfate, and bacteria. This apparent improvement is attributed partly to discontinued use of some leaky sewer lines and to high precipitation during 1979-80.GRA

N81-33701# National Center for Resource Recovery, Washington, D. C.
FERROUS METALS RECOVERY AT RECOVERY 1, NEW ORLEANS: PERFORMANCE OF THE MODIFIED SYSTEM, TEST NO. 4.05 AND TEST NO. 4.09, RECOVERY 1, NEW ORLEANS Final Report
Perry M. Bagalman Jun. 1981 40 p refs
(Contract EPA-68-01-4423)
(PB81-213324; EPA-600/2-81-102) Avail: NTIS HC A03/MF A01 CSCL 13B

Two series of samplings and the monitoring of energy consumption and shredder hammer wear of the upgraded ferrous recovery system that produces a light ferrous product from the processing of municipal refuse at a resource recovery project are reported. System sampling was conducted for each of two refuse processing lines that provide ferrous to the ferrous recovery system: a primary trommel and shredder, and shredder only. The upgraded ferrous recovery system includes an air knife to remove loose contamination and separate light and heavy gauge ferrous, a light ferrous shredder to liberate attached contamination and densify the light ferrous, and a secondary magnet for cleaning of the shredded light ferrous. GRA

N81-33702# National Center for Resource Recovery, Washington, D. C.
IMPROVEMENT OF MAGNETICALLY SEPARATED FERROUS CONCENTRATE BY SHREDDING: A PERFORMANCE TEST. TEST 4.07, RECOVERY 1, NEW ORLEANS
Kelly G. Runyon Jun. 1981 59 p refs
(Contract EPA-88-01-4423)
(PB81-213332; EPA-600/2-81-103) Avail: NTIS HC A04/MF A01 CSCL 13B

The shredding of ferrous product magnetically recovered from municipal waste in a small hammermill to free attached or entrapped contaminant is described. A belt magnet was used to separate metal from the liberated contaminant. Test results, the equipment used, and methods of sample analysis are described. GRA

N81-33703# Gilbert Associates, Inc., Reading, Pa.
COMPATIBILITY OF SOURCE SEPARATION AND MIXED-WASTE PROCESSING FOR RESOURCE RECOVERY Final Report
M. G. Klett, W. H. Fischer, B. N. Murthy, H. H. Fiedler, L. M. Oliva (Resource Planning Associates, Washington, D. C.), and R. Crystal (Crystal Planning and Commun., Inc.) Jun. 1981 194 p refs
(Contract EPA-68-02-2645)
(PB81-216046; EPA-600/2-81-097) Avail: NTIS HC A09/MF A01 CSCL 13B

Existing source separation programs and mixed-waste processing facilities were analyzed four broad areas of concern, energy and materials conservation, environmental impacts institutional and technological impacts, and economic impacts are considered. Issues most important for each viewpoint are assessed for each combination of options and alternatives. The issues addressed are: changes in production of useful energy from a mixed waste processing facility, air, land, and water pollution emissions, contractors employment, operator profitability, total solid waste collection costs, and quantities of recycled materials. GRA

N81-33704# GCA Corp., Bedford, Mass. Technology Div.
ENVIRONMENTAL ASPECTS OF FLUIDIZED-BED COMBUSTION Final Report
J. M. Robinson, R. J. Kindya, C. W. Young, R. R. Hall, and P. Fennelly Apr. 1981 80 p refs
(Contract EPA-68-02-2693)
(PB81-217630; GCA-TR-80-108-G; EPA-600/7-81-075) Avail: NTIS HC A05/MF A01 CSCL 13B

Emissions data indicate that FBC technology is a viable alternative to conventional coal combustion. Adverse impacts on health or the environment appear to be minimal; at worst, they are no different than for conventional coal combustion systems. To support this conclusion, specific results of FBC sampling and analysis from work performed through late 1979 are discussed. GRA

N81-33705# Research Triangle Inst., Research Triangle Park, N. C.
EVALUATION OF RELATIVE ENVIRONMENTAL HAZARDS FROM A COAL GASIFIER Final Report, Nov. 1976 - Apr. 1981
S. K. Gangwal, J. G. Cleland, and R. S. Truesdale Jun. 1981 108 p refs
(Grant EPA-R-804979)
(PB81-217648; EPA-600/7-81-100; RTI/1934/00-02F) Avail: NTIS HC A06/MF A01 CSCL 13B

Environmental hazards from a laboratory scale coal gasifier were evaluated. Relative environmental hazards were determined by the multimedia environmental goals methodology. Toxicity and mutagenicity were assessed. It is found that environmentally, the most significant effluent stream is aqueous condensate, followed by tar, product gas, and ash. However, on an equivalent weight basis, the tar stream is more toxic and mutagenic than aqueous condensate. Polycyclic aromatic hydrocarbons and organic bases are the most mutagenic fractions of the tar. Coal pyrolysis and gasificaion at higher tempratures leads to reduced tar mutagenicity. GRA

N81-33706# Geological Survey, Menlo Park, Calif. Water Resources Div.
WATER-QUALITY ASSESSMENT OF THE MERCED RIVER, CALIFORNIA, IN THE 1977 WATER YEAR
Stephen K. Sorenson and Ray J. Hoffman Mar. 1981 39 p refs Prepared in cooperation with California State Dept. of Water Resources
(PB81-205668; USGS/WRD/WRI-81/038; USGS/WRI-80-75) Avail: NTIS HC A03/MF A01 CSCL 13B

Samples taken at the record on near-record low flows of the 1976-77 drought, show that calcium and bicarbonate were

the predominant ions in the water. Inflow of irrigation return water to the river caused a threefold to sevenfold increase in specific conductance between river kilometer 42 and the farthest downstream station at river kilometer 8. During the four sampling periods, the increase in total nitrogen concentrations was two-fold to sixfold in that reach. Upstream of kilometer 42, the river was free of apparent water-quality degradation, with the exception of occasional increase in nitrogen and phosphorus. Measurements of primary productivity and phytoplankton in Lake McClure and at three river stations gave indications of trophic conditions in the river system. Author

N81-33707# Geological Survey, Menlo Park, Calif. Water Resources Div.

GROUND-WATER QUALITY ALONG THE MAJAVE RIVER NEAR BARSTOW, CALIFORNIA, 1974 - 1979 Water Resources Investigations

Lawrence A. Eccles Mar. 1981 69 p refs
(PB81-205676; USGS/WRD/WRI-81/039; USGS/WRI-80-109) Avail: NTIS HC A04/MF A01 CSCL 13B

Degradation occurred as a result of wastewater discharge and irrigation return. Characteristics of the degraded ground water include concentrations of dissolved solids exceeding 1,000 milligrams per liter, odor threshold numbers exceeding 5, dissolved organic carbon exceeding 20 milligrams per liter, chloride exceeding 250 milligrams per lier, phenols exceeding 1 microgram per liter, and methylene blue active substances exceeding 0.20 milligram per liter. The ground-water-quality monitoring data show that few changes in the concentration and distribution of chemical constituents occurred between 1974 and 1977, but between 1977 and 1979 there were overall decreases in most constituents and in odor. GRA

N81-33708# Jordan (Edward. C.) Co., Inc., Portland, Maine.

EVALUATION OF ION EXCHANGE TECHNOLOGY FOR TOXIC AND NON-CONVENTIONAL POLLUTANT REDUCTION IN BLEACH PLANT EFFLUENTS Final Report, 24 Jan. - 1 Oct. 1980

James H. Fitch, Jr. May 1981 284 p refs
(Contract EPA-68-03-2605)
(PB81-208175; EPA-600/2-81-086) Avail: NTIS HC A13/MF A01 CSCL 13B

Three design schemes were developed for treating effluents: the Dow process, the Rahm & Haas process, and the Billerud Non-Polluting Bleach Plant Concept. Of these systems, only the Billerud Non-Polluting Bleach Plant Concept was used on a full-scale basis in the pulp, paper, and paperbroad industry. Batch and pilot plant ion exchange installations of the Billerud Non-Polluting Bleach Plant Concept at Billerud Uddeholm AB in Skoghall, Sweden were evaluated as a portion of this project. This assessment was undertaken to ascertain actual operation parameters and removal efficiencies, as well as associated problems and costs. Capital, operation, and maintenance costs were projected for a full-scale computer controlled plant of the Billerud Non-Polluting Bleach Plant Concept to serve a 110,000 ton/year bleach plant. GRA

N81-33709# Mississippi State Univ., Mississippi State.

APPLICATION OF ION EXCHANGE AND ULTRAFILTRATION FOR REMOVAL OF COLOR FROM GROUNDWATER M.S. Thesis

Keith J. Lowery May 1981 134 p refs
(Contract DI-14-34-0001-0126)
(PB81-209058; W81-03262; OWRT-A-132-MISS(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

Ion exchange and ultrafiltration were studied as a treatment alternative for removal of naturally occurring organic color from a groundwater supply. Assessment of five strong base and one weak base anion exchange resins by batch and column studies showed that excellent color removal could be obtained with IRA-940, a strong base divinyl benzene resin. The resin showed excessive decrease in capacity upon regeneration. Batch studies showed that IRA-940 could be regenerated to 80% of its original capacity; three column runs showed a reduction in treatment from the initial 3,300 bed volumes to 750 and 375 after the first and second regenerations, respectively. The major anions in the water - bicarbonates, chlorides and phosphates - were monitored along with the color for all batch and column studies. GRA

N81-33710# Maine Univ., Orono. Land and Water Resources Center.

MODELING HEAVY METAL TRANSPORT IN RIVER SYSTEMS

Franklin E. Woodard, James H. Fitch, Jr., and Richard A. Fontaine Apr. 1981 91 p refs Sponsored by Dept. of Interior
(PB81-209108; W81-03251; OWRT-A-037-ME(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

A mathematical model for prediction of the probable fate of heavy metals in rivers downstream from wastewater discharges was developed. The developed model accounts for hydraulic mixing processes of rivers, and relies heavily on the relationship between suspended particulate matter transport and heavy metals transport. GRA

N81-33711# Maine Univ., Orono. Land and Water Resources Center.

EFFECT OF SOIL MOISTURE CONTENT UPON ADSORPTION AND MOVEMENT OF PHOSPHORUS FROM LEACHATES OF DOMESTIC WASTE DISPOSAL SYSTEMS

Willem F. Brutsaert, Warren E. Hedstrom, and Thomas G. McNeice Nov. 1980 60 p refs Sponsored by the Dept. of the Interior
(PB81-209173; W81-03270) Avail: NTIS HC A04/MF A01 CSCL 13B

The effects of soil moisture content upon movement and adsorption of phosphorus (P) were investigated in order to optimize the design of leachfields. Three plexiglass laboratory soil columns containing the same Adams soil were loaded with a P solution (25 mg/liter as P) at rates to maintain constant saturation levels throughout the column (1.0), 0.86, and 0.64). Reducing the degree of saturation, by controlling infiltration rate in otherwise physically similar columns, increased the soil adsorptive capacity and hence greatly reduced the extent of P penetration into the column per pore volume of influent applied. GRA

N81-33712# Gulf South Research Inst., New Orleans, La.

METHODS FOR THE RECOVERY OF ORGANIC CARCINOGENS FROM WATER Final Report, 1 Nov. 1977 - 31 Oct. 1978

Kenneth Ehrlich, George Cawley, and Elias Klein May 1981 41 p refs
(Grant EPA-R-805656)
(PB81-209694; EPA-600/4-81-039; ERLGB-148) Avail: NTIS HC A03/MF A01 CSCL 13B

The organic carcinogens benzo(a)pyrene, dieldrin, and N-acetyl-2-aminofluorene were recovered on XAD-2 macroreticular resin in yields of 90 percent or more from distilled water or seawater and in yields of 40 percent or more from Lake Pontchartrain water containing a high concentration of organic material. The original solutions contained less than 500 parts per trillion of carcinogen. These results show that XAD-2 provides an efficient means for recovering nonpolar organic carcinogens from dilute solutions. GRA

N81-33713# Environmental Protection Agency, Research Triangle Park, N.C.

PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1979 Annual Report

1980 60 p refs
(PB81-210171) Avail: NTIS HC A04/MF A01 CSCL 13B

Measures taken toward implementing the purpose and intent of the clean air act are reported. The issues involved in the prevention and control of air pollution and the major elements of progress toward that goal are described. Three other EPA reports to Congress rquired under the Clean Air Act are presented and include: a report on measures taken in relation to motor vehicle emission control; a report on Federal procurement and violating facilities and a report on major emitting facilities. GRA

N81-33714# National Center for Resource Recovery, Washington, D. C.

MAGNETIC DRUM SEPARATOR PERFORMANCE SCALPING TROMMEL UNDERFLOW AT NOMINAL DESIGN CONDITIONS. TEST NO. 4.01, RECOVERY 1, NEW ORLEANS

Jun. 1981 71 p refs
(Contract EPA-68-01-4428)
(PB81-213308; EPA-600/2-81-100) Avail: NTIS HC A04/MF A01 CSCL 13B

The first test of the separator is described. The objective of the test was to document the performance of the trommel-unders magnetic drum separator with the trommel processing raw municipal solid waste at the nominal design feed rate of 62.5 tph. GRA

N81-33715# National Center for Resource Recovery, Washington, D. C.
MAGNETIC DRUM SEPARATOR PERFORMANCE SCALPING SHREDDED TROMMEL OVERFLOW AT NOMINAL DESIGN CONDITIONS. TEST NO. 4.03, RECOVERY 1, NEW ORLEANS
Jun. 1981 56 p refs
(Contract EPA-68-01-4423)
(PB81-213316; EPA-600/2-81-101) Avail: NTIS HC A04/MF A01 CSCL 13B

Shredded trommel overs refers to waste which reports to the oversize discharge from the trommel and is subsequently shredded. For this test, the trommel process _ raw municipal solid waste at the design feed rate, 62.5 tph. GRA

N81-33716# Duke Univ., Durham, N. C. School of Forestry and Environmental Studies.
LAKE DATA ANALYSIS AND NUTRIENT BUDGET MODELING
Kenneth H. Reckhow Feb. 1981 72 p refs Sponsored by Environmental Research Lab.
(PB81-206039; EPA-600/3-81-011) Avail: NTIS HC A04/MF A01 CSCL 13B

Several quantitative methods that may be useful for lake trophic quality management planning are discussed and illustrated. An emphasis is placed on scientific methods in research, data analysis, and modeling. Proper use of statistical methods is also stressed, along with considerations of uncertainty in data analysis and modeling. Following an introductory discussion of scientific methods, limnological variables important to lake quality management were reviewed. Methods of data acquisition or sampling design are then presented, along with techniques for analyzing summarizing, and presenting data (with an emphasis on robust methods). A step by step procedure for the prediction of phosphorus concentration and the estimation of the prediction uncertainty from land use information and certain lake characteristics is presented. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N81-33717*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE STORMS: AIRGLOW AND RELATED MEASUREMENTS. VLF OBSERVATIONS, VOLUME 4
Jun. 1981 180 p refs
(NASA-TM-84022; NSSDC/WDC-A-R/S-81-01) Avail: NTIS HC A09/MF A01 CSCL 04A

The data presented show the typical values and range of ionospheric and magnetospheric characteristics, as viewed from 1400 km with the ISIS 2 instruments. The definition of each data set depends partly on geophysical parameters and partly on satellite operating mode. Preceding the data set is a description of the organizational parameters and a review of the objectives and general characteristics of the data set. The data are shown as a selection from 12 different data formats. Each data set has a different selection of formats, but uniformity of a given format selection is preserved throughout each data set. Each data set consists of a selected number of passes, each comprising a format combination that is most appropriae for the particular data set. Description of ISIS 2 instruments are provided. T.M.

N81-33718# Hawaii Inst. of Geophysics, Honolulu.
THE NEW GRAVITY SYSTEM: CHANGES IN INTERNATIONAL GRAVITY BASE VALUES AND ANOMALY VALUES
George P. Woollard and Valerie M. Godley Oct. 1980 190 p refs
(Contracts N00014-75-C-0209; Grant NSF EAR-77-28552; NR Proj. 083-603)
(AD-A095615; HIG-80-1) Avail: NTIS HC A09/MF A01 CSCL 08/5

The effect of adopting the Geodetic Reference System 1967 (GRS 67) theoretical gravity formula and the International Gravity Standardization Net 1971 (IGSN 71) on gravity anomaly values is assessed. The gravity standard represented in the IGSN 71 values is shown to not conform to that of modern absolute gravity values as well as one might expect although, overall, the apparent discrepancy does not appear to be greater than about 0.03 mgal/1000 mgal change. That the source of error probably lies in the IGSN 71 adjustment is brought out by the close agreement (0.03 mgal) for pendulum and absolute gravity intervals between Washington and Teddington and Paris and Teddington which differ by approximately 0.1 mgal from the IGSN 71 intervals between these sites. The Potsdam datum correction of -14.0 mgal incorporated in the IGSN 71 values is shown to be essentially correct to within 0.03 mgal. Evaluation of 773 international gravity values published by Woollard and Rose (1963), which have been used extensively for gravity control, using the IGSN 71 values as a standard shows: (A) there is no detectable difference in gravity standard defined for observations at pendulum sites except in South America and India; (B) the median average datum difference relative to the IGSN 71 values is -14.7 mgal; (C) On an areal basis the gravity standard difference defined in South America, which amounts to 0.2 mgal/1000 mgal, characterizes the Woollard/Rose values in other areas but is masked by compensating tares (datum shifts) when only the data for pendulum sites is considered. GRA

N81-33719# Harry Diamond Labs., Adelphi, Md.
THE AURORA BREMSSTRAHLUNG ENVIRONMENT
Klaus G. Kerris Jul. 1981 23 p refs Sponsored in part by Defense Nuclear Agency
(AD-A103660; HDL-TM-81-18) Avail: NTIS HC A02/MF A01 CSCL 04/1

This report compiles all measurements and calculations characterizing the bremsstrahlung output of AURORA. The first part gives measurements of the dose distribution throughout the test cell and on the anode faceplates. All dose maps are given in normalized form so that the dose and the dose rate may easily be found for any Marx charging voltage. The second part describes the measured time history of the bremsstrahlung pulse from early times to very late times over four decades of amplitude. The third part discusses the bremsstrahlung energy spectrum and presents calculations of the energy and the angular distribution of photons. It is hoped that this report will be useful to prospective experimenters planning tests at the AURORA Facility.
Author (GRA)

N81-33720# Science Applications, Inc., La Jolla, Calif. Electronics Vision and Systems Div.
SATELLITE MEASUREMENTS OF ATMOSPHERIC AEROSOLS Annual Report, 15 Nov. 1980 - 26 Aug. 1981
M. Griggs 26 Aug. 1981 21 p refs
(Contract N00014-77-C-0489)
(AD-A103493; SAI-131-81-275-LJ) Avail: NTIS HC A02/MF A01 CSCL 04/1

Analysis of NOAA-6 AVHRR data and ground-truth measurements at two locations has found a radiance-aerosol content relationship which agrees very well with that previously determined for LANDSAT 2 Data. A new technique was developed to use AVHRR Channels 1 and 2 radiances to infer aerosol size distribution information, in addition to the optical thickness. The technique was successfully tested with a small data set obtained in a ground-truth experiment on the USNS Hayes. Author (GRA)

N81-33721# Naval Research Lab., Washington, D. C. Applied Optics Branch.
OPTICAL EXTINCTION PREDICTIONS FROM MEASUREMENTS ABOARD A BRITISH WEATHER SHIP Final Report

G. L. Trusty and T. H. Cosden 27 Aug. 1981 48 p refs (SO301SH)
(AD-A103624; NRL-8497) Avail: NTIS HC A03/MF A01 CSCL 04/1

The measurements of a weather ship over a 20 day period in the month of July are reported. Using two particle measuring systems (PMS) particle spectrometers, marine aerosols with radii in the size range from 0.1 to 15 micrometers were measured. Statistics show the most frequent aerosol extinction to be near 0.02/km for 0.55 micrometer and 0.005 km for 10.0 micrometers. It is disclosed that calculated extinction versus wavelength for several conditions the ratio for extinctions is not constant.
Author (GRA)

N81-33722# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
NONLINEAR PHENOMENA ARISING FROM RADIO WAVE HEATING OF THE LOWER IONOSPHERE
Albert Andrew Tomko Aug. 1981 184 p refs
(Contract N00014-81-K-0276; Grant NSF ATM-78-19964; NR Proj. SR-108)
(AD-A103538; PSY-TRL-SCI-470) Avail: NTIS HC A09/MF A01 CSCL 20/14

This document describes a theoretical and experimental study of the interaction of high power, high frequency radio waves with the lower ionosphere. The theoretical calculations presented here show that the electron temperature of the ionospheric plasma can be greatly enhanced when the plasma is irradiated by a powerful groundbased HF transmitter with an effective radiated power of the order of 100 MW. If this plasma heating is maintained for times exceeding a few seconds, the composition of the plasma can also be altered. These temperature and composition modifications cause significant changes in the plasma conductivity and wave absorption in the medium. Two experiments were conducted in order to test for the predicted absorption and conductivity modifications: a vertical incidence plus absorption experiment and a nonlinear demodulation experiment. Data from the absorption experiment clearly show a large (9 dB) increase in wave absorption at 2.4 MHz due to a high power (60 MW ERP) HF heating of the ionosphere. The nonlinear demodulation experiment generated strong VLF radiation when the ionosphere was irradiated by a powerful modulated HF wave. These VLF signals are believed to be due to HF heating induced conductivity modulation of the dynamo current system. Author (GRA)

N81-33723# Regis Coll., Weston, Mass.
DESIGN AND DEVELOPMENT OF ELECTRICAL AND MECHANICAL INSTRUMENTS FOR THE AURORAL-E PROGRAM
Peter B. Anderson and Donald Girouard 1 May 1981 31 p refs
(Contract F19628-80-C-0116; AF Proj. 2311)
(AD-A104045; SCIENTIFIC-1) Avail: NTIS HC A03/MF A01 CSCL 04/1

The Auroral E-Program consisted of four rocket payloads which were launched from the Poker Flat Research Range, Fairbanks, Alaska, on March 6, 1981. This report describes the engineering activities carried out during the development of the A10.903 payload. The payload experiment consisted of a double-probed electric field instrument to measure ac and dc electric fields, a density strip for measuring electron densities, and an automatic gain control (AGC) unit. Auroral-E Program objectives were to obtain in-situ measurements of several atmospheric and ionospheric parameters during a continuous diffuse aurora. GRA

N81-33724# Rome Air Development Center, Griffiss AFB, N.Y.
VLF/LF REFLECTIVITY OF THE POLAR IONOSPHERE Interim Report, 4 May - 20 Sep. 1980
Robert P. Pagliarulo, John P. Turtle, John E. Rasmussen, Ralph E. Gifford, and Wayne I. Klemetti Mar. 1981 95 p refs
(AF Proj. 2305)
(AD-A103957; RADC-TR-81-80) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report provides a summary of high-latitude ionospheric reflectivity data, as observed by the USAF high-resolution VLF/LF ionosounder operating in northern Greenland. Ionospheric reflectivity parameters, including reflection heights and coefficients, are presented as a function of time of day. Riometer and magnetometer measurements of the polar propagation environment are presented as supplementary data. Author (GRA)

N81-33725# SRI International Corp., Menlo Park, Calif.
SIMULTANEOUS CHATANIKA RADAR AND s3-2 SATELLITE MEASUREMENTS OF IONOSPHERIC ELECTRODYNAMICS IN THE DIFFUSING AURORA Final Report, 18 Jan. 1979 - 18 Apr. 1981
Richard R. Vondrak Hanscom AFB, Mass. AFGL Jun. 1981 58 p refs
(Contract F19628-79-C-0038; AF Proj. 2311)
(AD-A104047; AFGL-TR-81-0166) Avail: NTIS HC A04/MF A01 CSCL 04/1

Simultaneous Chatanika radar and S3-2 satellite measurements have been used to investigate the spatial variation of the electrical properties of the auroral-zone ionosphere. Of special interest are the latitudinal variations of the ionospheric electric field, ionization, conductivity, and currents. This report compares the simultaneous radar and satellite measurements during two early-evening passes in February 1976. Measurements by the radar and satellite were remarkably consistent, except for the ionization and temperature measurements by the S3-2 Langmuir probe. During both passes, the equatorward boundary of the diffuse aurora was nearly overhead at Chatanika, Alaska. Although the configurations of ionization and conductivity were nearly identical in these two passes, the latitudinal variations of the ionospheric electric field and field-aligned current were quite dissimilar. In one pass (Revolution 1031 on 17 February 1976), the auroral electric field extended into the through, penetrating to about 2 deg equatorward of the diffuse aurora. In the other pass (Revolution 1144 on 25 February 1976), the electric field and field-aligned current were negligibly small in the trough, but were substantially enhanced at the diffuse auroral boundary. Because the ionospheric morphology was so similar on the two days, the source of the different electrodynamic patterns appears to be related to magnetospheric conditions. This report also identifies simultaneous data sets from early 1978, including examples of the radar measurements. Author (GRA)

N81-33726# Systems and Applied Sciences Corp., Riverdale, Md.
REDUCTION AND ANALYSIS OF ROCKET-BORNE AND BALLOON-BORNE SENSOR DATA Scientific Report, 15 Jan. 1980 - 14 Jan. 1981
Paul F. Hilton Hanscom AFB, Mass. AFGL 15 Feb. 1981 25 p refs
(Contract F19628-80-C-0058; AF Proj. 9993)
(AD-A104037; AFGL-TR-81-0036; SR-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report discusses the analysis and reduction of digitized data transmitted from probes flown on research balloons and on research rockets in the 50 500 km altitude range. The nature of the data transmission allows a standard procedure to be used, regardless of the experiment. This report details this standard approach and describes one experiment as an example.
Author (GRA)

N81-33727# Weston Observatory, Mass. Dept. of Geology and Geophysics.
GEOKINETIC ENVIRONMENT INVESTIGATIONS Final Report, 1 Oct. 1977 - 30 Sep. 1980
Eugene B. Hartnett, Eric D. Carleen, and Joseph I. Blaney Hanscom AFB, Mass AFGL 31 Mar. 1981 64 p refs
(Contract F19628-79-C-0008; AF Proj. 7600)
(AD-A104048; AFGL-TR-81-0137) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report covers the development and implementation of special concepts, techniques and instrumentation for the collection, analysis and application of geokinetic data. The Geokinetic Data Acquisition System (GDAS) was modified, maintained and operationally deployed to various sites designated by AFGL. Tests were conducted at the Defense Nuclear Agency (DNA) CASINO Facility in Maryland; Central Inertial Guidance Test Facility (CIGTF), Holloman AFB, N.M.; Space Transportation System (STS) Launch Complex, Vandenberg AFB, Ca. and the SAC Wing V Minuteman Complex at Cheyenne, Wy. The CASINO data contributed to SAMSO's MX/TGG Advanced Development Bridge II

Program for radiation hardening of third generation hardware. The CIGTF investigation supported USAF requirements for highly precise azimuth reference. The Hill AFB the performance of a minuteman III missile guidance system in an engineering silo. The STS program at Vandenberg AFB was to assist in determining the nature of a Titan III-D pressure load. The SAC Wing V deployment was to investigate plateau/valley basin geologic characteristics in respect to motion response. GRA

N81-33728# Naval Environmental Prediction Research Facility, Monterey, Calif.

THE ATMOSPHERIC TRANSMISSION GENERATION SYSTEM FOR SATELLITE INFRARED SOUNDERS Final Report

Thomas J. Kleespies Jul. 1981 39 p refs

(AD-A104025; NEPRF-TR-81-03) Avail: NTIS HC A03/MF A01 CSCL 04/1

The Atmospheric Transmission Generation System is a collection of computer programs which generate atmospheric transmission profiles for satellite-borne infrared sounders. Some of this system's components have been used to produce a monochromatic transmittance tape (MTT) which covers the spectral range from 640-780/cm with a resolution of 0.1/cm. The MTT can be used in conjunction with other programs in this system to quickly and easily produce spectral atmospheric transmission profiles, which can subsequently be used for temperature retrievals. Author (GRA)

N81-33729# Ohio State Univ., Columbus. Dept. of Geodetic Science.

THE USE OF FINITE ELEMENTS IN PHYSICAL GEODESY

Peter Meissl Hanscom AFB, Mass. AFGL Apr. 1981 309 p refs

(Contract F19628-79-C-0075; AF Proj. 7600)

(AD-A104164; DGS-313; SR-7) Avail: NTIS HC A14/MF A01 CSCL 08/5

Currently used methods of computational physical geodesy are compared with respect to their efficiency during production runs on a computer. These methods include: (1) Least Squares adjustment with respect to spherical harmonics; (2) Surface layers, buried masses and related methods; (3) Least squares collocation; (4) Representation of the potential by spline functions; and (5) Explicit integral formulas. As an alternative, the feasibility of applying the finite element method to the fundamental problems of physical geodesy is investigated. The methods listed under (1)-(4) can be dramatically speeded up if the distribution of data and weights satisfies certain symmetry-requirements which are rather stringent. Method (5) relies altogether on a special type and distribution of data. In the absence of data homogeneity and regularity, the finite element method is asymptotically superior with respect to computational efficiency. Let N denote the number of parameters necessary to describe the variation of the potential on the reference surface. The computational effort associated with methods (1)-(4) grows proportional to N cubed. That one resulting from finite elements grows proportional to N to the 3/2 power. The constants of proportionality are, however, unfavorable for the finite element method. Hence its superiority comes through only for large values of N, which, in case of a global solution, corresponds to data averaged over 2 deg x 2 deg blocks. Author (GRA)

N81-33730# Denver Univ., Colo. Dept. of Physics.

STRATOSPHERIC CRYOGENIC INFRARED BALLOON EXPERIMENT. A 0.1/CM LN2 COOLED BALLOONBORNE FOURIER TRANSFORM SPECTROMETER SYSTEM Final Report, 3 Jul. 1978 - 2 Jan. 1981

F. H. Murcray, F. J. Murcray, D. G. Murcray, and W. J. Williams Hanscom AFB, Mass. AFGL 1 May 1981 28 p

(Contract F19628-78-C-0164; AF Proj. 2310)

(AD-A104168; AFGL-TR-81-0186) Avail: NTIS HC A03/MF A01 CSCL 14/2

A balloon-borne liquid nitrogen cooled Fourier transform spectrometer system was test-flown from Holloman Air Force Base on 8 October 1980. The system and the modifications to it required for balloon application are described and the flight results discussed. Samples of the interferograms obtained during the flight and their transforms are presented. Procedures for improving the performance on subsequent flights are discussed. Author (GRA)

N81-33731# California Univ., Livermore. Lawrence Livermore Lab.

DETECTION OF WATER-FILLED AND AIR-FILLED UNDERGROUND CAVITIES

Edwin F. Laine 1 Dec. 1980 18 p refs

(Contract W-7405-eng-48)

(DE81-025123; UCRL-53127) Avail: NTIS HC A02/MF A01

Tunnel and cavern detection methods were tested at two experimental sites. Cross-borehole methods using high frequency electromagnetic wave diffraction techniques were used over a frequency range of 1 to 100 MHz. A cross-borehole method using direct current was also used. The experimental sites are karstic. The caverns and tunnels were water-filled at one site and dry at the other site. DOE

N81-33732# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.

COMPUTER PROGRAM FOR PROCESSING IONOSPHERE DATA [DATORPROGRAM FOER BEARBETNING AV JONOSFAERDATA]

R. Mellberg and L. Baecklund Nov. 1980 35 p In SWEDISH

(FOA-C-30207-E2) Avail: NTIS HC A03/MF A01

The MEDGEN program which brings together data from reports which are distributed to a great number of ionosphere stations in the world is described. Moreover, the test programs, JONTST and DELTST, used for MEDGEN in-data were reviewed. The completely rewritten MEDGEN program has no in-data control, so this takes place in the test programs which are also rewritten. A short description is given of the ionosphere and how the measuring of strata thickness and electron density in the different strata is carried out by means of an ionospheric sonde. An example of an ionogram is presented and discussed. Author (ESA)

N81-33733# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

SOUNDING ROCKET PROGRAM MAGNETOSPHERE. STUDY OF MAGNETOSPHERIC ELECTRIC FIELDS PARALLEL TO THE EARTH'S MAGNETIC FIELD WITH ARTIFICIALLY INJECTED ELECTRONS Final Report

Klaus Wilhelm and Christian Becker Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 28 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-007; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformetionszentrum, Karlsruhe, West Germany DM 5,90

The properties and conditions of cccurrence of magnetospheric electric fields parallel to the Earth's magnetic field are described. The observations carried out up to now are discussed as well as the possibilities of studying these fields by artificially injected electrons. In preparation for a SPACELAB experiment, a sounding rocket investigation aimed at observing reflected electron beams was carried out. Those aspects of the experiment that involve the German contribution are described and the first results communicated. The electron fluxes, both from artificial and natural origin, provide evidence about the configuration of electric fields parallel to the magnetic field lines in the magnetosphere. The observed reflections take place at a height of about 1.5 Earth radii, as predicted by theory. The small number of observed echoes and technicål difficulties with the accelerator do not allow an examination of the internal electric field structure. Author (ESA)

N81-33734# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

SOUNDING ROCKET PROGRAM AERONOMY: EXPERIMENTS FOR SMALL SOUNDING ROCKETS TO MEASURE ION AND ELECTRON DENSITY AT HEIGHTS BETWEEN 40 AND 100 KM. PROBLEMS, DEVELOPMENT AND RESULTS Final Report

Hans-Ulrich Widdel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 113 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-012; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,80

Experiments and small sounding rockets which allow measurements of electron and ion density between 40 and 100 km are described. The winter anomaly effect in the absorption of short waves in the D-region of the ionosphere was investigated. Results obtained between 1972 and 1975 are presented. Results of further work to develop special probes for selected trace elements are communicated. It is proved that quite complicated experiments can be built in small meteorological rockets and that their low cost allows series measurements. Author (ESA)

N81-33735# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.

THE NOAA SOLAR EPHEMERIS PROGRAM

Albion D. Taylor Jan. 1981 35 p refs

(PB81-209991; NOAA-TM-ERL-ARL-94; NOAA-81042114) Avail: NTIS HC A03/MF A01 CSCL 04A

A system of FORTRAN language computer programs is presented which have the ability to locate the Sun at arbitrary times. On demand, the programs will return the distance and direction to the Sun, either as seen by an observer at an arbitrary location on the Earth, or in a standard astronomic coordinate system. For one century before or after the year 1960, the program is expected to have an accuracy of + or - 30 seconds of arc (2 seconds of time) in angular position, and + or - 0.00007 A.U. in distance. A non-standard algorithm is used which minimizes the number of trigonometric evaluations involved in the computations. GRA

N81-33736# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.

USER'S MANUAL FOR MIXING HEIGHT COMPUTER PROGRAM

Robert F. Kelly May 1981 30 p refs

(PB81-209371; EPA-450/4-81-022) Avail: NTIS HC A03/MF A01 CSCL 13B

A FORTRAN language computer program was developed to estimate mixing height values for use in the Empirical Kinetic Modeling Approach/Ozone Isopleth Plotting Package (EKMA/OZIPP). This program uses temperature, pressure and height values measured at a surface site, and from atmospheric vertical profiles (e.g., radiosondes). The manual contains intructions on how to use the program, including a description of the data needed, how to format the data, and an explanation of the output from the program. Examples of input and output are also included. GRA

N81-33530# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

PRACTICAL APPLICATION OF GRAPHICAL DATA PROCESSING FOR TASKS OF GEOLOGICAL SURVEYS [PRAKTISCHE ANWENDUNG DER GRAPHISCHEN DATENVERARBEITUNG FUER AUFGABEN GEOLOGISCHERDIENSTE]

Gottfried Gabert and Bernard Schmidt *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 31-41 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)

Avail: NTIS HC A07/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N81-33737 World Meteorological Organization, Geneva (Switzerland).

WORLD WEATHER WATCH. GLOBAL OBSERVING SYSTEM-SATELLITE SUBSYSTEM. INFORMATION ON THE APPLICATION OF METEOROLOGICAL SATELLITE DATA IN ROUTINE OPERATIONS AND RESEARCH. ABSTRACTS, ANNUAL SUMMARIES AND BIBLIOGRAPHIES, SUPPLEMENT NUMBER 4

May 1980 190 p refs

(WMO-475-Suppl-4) Avail: Issuing Activity

Information on the application of meteorological satellite data in routine operations and research is presented in abstracts, annual summaries and bibliographies of papers and publications issued in 1979 by the following countries: Argentina, Australia, Austria, Bulgaria, Canada, France, Federal Republic of Germany, Hong Kong, Hungary, India, Israel, Italy, Japan, New Zealand, Sudan, Switzerland, Union of Soviet Socialist Republics, United Kingdom, and the United States of America. Author (ESA)

N81-33738*# Arizona Univ., Tucson. Inst. of Atmospheric Physics.

THE EFFECTS OF CLOUDS ON THE LIGHT PRODUCED BY LIGHTNING Progress Report, 15 Sep. 1980 - 15 Sep. 1981

L. W. Thomason and E. P. Krider 18 Sep. 1981 50 p refs Submitted for publication

(Contract NAS8-33718)

(NASA-CR-161875) Avail: NTIS HC A03/MF A01 CSCL 04B

A Monte Carlo simulation of the effects of finite clouds on the light impulses was produced by point and finite lightning sources within cubical, cylindrical, and spherical clouds. It is shown that absorption is essentially negligible in the visible and near infrared. The fractions of photons which escape various cloud surfaces are a function of position and geometry of the source. The light emission is high for intracloud discharges and the incloud portion of cloud to ground discharges. It is concluded that the characteristic dimensions of the light escaping from a cloud surface are typically 60 to 70% of the cloud dimensions while the time broadening of an impulse by multiple scattering can be tens of microseconds or more. E.A.K.

N81-33739# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

BIGGS AAF, EL PASO, TEXAS. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

14 Jan. 1981 509 p refs

(AD-A095335; AD-E850017; USAFETAC/DS-81/026) Avail: NTIS HC A22/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Biggs AAF, El Paso, Texas. It contains the following parts: (A) Weather conditions, Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus visibility, Sky cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) Pressure summary (means, standard deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occuring tables. GRA

N81-33740# Range Commanders Council, White Sands Missile Range, N. Mex.

METEOROLOGICAL DATA ERROR ESTIMATES Final Report

Aug. 1981 29 p refs Revised

(AD-A103682; RCC/MG-110-81) Avail: NTIS HC A03/MF A01 CSCL 04/2

Range users must depend on the ranges for uniform and realistic quotations of the validity of environmental data to determine the reliability of tests results. To help satisfy this need, a Committee of the Meteorological Group (MG), Range Commanders Council (RCC), has compiled standard error estimates for meteorological data currently furnished to users on the National Ranges and Department of Defense (DOD) Major Test Facilities. A table of pressure, temperature and density versus altitude from the 1976 Standard Atmosphere is included in the document to assist users in determining the approximate altitude range which corresponds to the various values of upper air meteorological parameters. A table of conversion factors is also included. This document was originally published in 1965 as IRIG Document 110-64, Meteorological Equipment Data

Accuracies, and again in 1971 as RCC Document 110-71, Reliability and Meteorological Data. The latter title has been largely misunderstood. Therefore, for somewhat more ease of application and better understanding, the values reported were changed to error estimates of meteorological data in the 1977 revision designated RCC Document 110-77. Data representing error estimates of upper air meteorological parameters obtained by the new Meteorologicl Sounding System are included in this revision of the document. GRA

N81-33741# Range Commanders Council, White Sands Missile Range, N. Mex. Meteorological Group.
METEOROLOGICAL DECISION ASSISTANCE Final Report
Aug. 1981 44 p refs
(AD-A103683; RCC/MG-350-81) Avail: NTIS HC A03/MF A01 CSCL 04/2

An introduction to the basic concepts and operations of decisionmaking in range meteorology is presented. The material provides an awareness of the capabilities of operational decision models and typical situations where they should be used, and demonstrates to range customers the value of using meteorological forecasts in decisionmaking. E.A.K.

N81-33742# Naval Research Lab., Washington, D. C.
MARITIME ATMOSPHERE SALT LOAD MONITORING SYSTEM
David J. Bressan 10 Aug. 1981 45 p refs
(AD-A103264; NRL-MR-4581) Avail: NTIS HC A03/MF A01 CSCL 04/2

An automatic atmospheric salt load sampling device was designed and deployed on shipboard, traversing the North Atlantic from January to June, 1980. Derived from our Automatic Radon Counter, the device has operated unattended for up to five weeks at sea. Salt load samples were analyzed in the laboratory, while NRL sensors provided data on atmospheric radon concentration, wind speed and direction, ship's speed and heading and GMT. All data sources were polled and recorded at the time of sample acquisition by an NRL designed hard-wired digital data handling system. Electronic circuit diagrams for the control and data handling units are shown and described, for the purposes of construction and maintenance of a system. Author (GRA)

N81-33743# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
MEAN ANNUAL SNOWFALL AT AIR NATIONAL GUARD BASES 1950-51 TO 1978-79
Gregory Schmit, Carlton F. Brown, and Mark Hamberger Apr. 1981 144 p
(AD-A104065; AD-E850097; USAFETAC/PR-81/001) Avail: NTIS HC A07/MF A01 CSCL 04/2

This summary includes mean annual and monthly snowfall values for 138 Air National Guard bases in the United States including Puerto Rico, from 1950-51 to 1978-79 season. GRA

N81-33744# Calspan Advanced Technology Center, Buffalo, N.Y.
A FEASIBILITY STUDY OF NUMERICAL SIMULATION OF INVERSION-RISING MARINE STRATUS AND FOG Final Report
C. William Rogers and James T. Hanley Aug. 1981 37 p refs
(Contract N00014-79-C-0459)
(AD-A103948; CALSPAN-6512-M-2) Avail: NTIS HC A03/MF A01 CSCL 04/2

Raising of the marine inversion above the lifting condensation level by mesoscale vertical motion associated with warm water patches can produce stratus and subsequently fog may form. The feasibility of numerical simulation of these inversion rising situations was examined. A modified numerical framework, constructed from the Lavoie model, is capable of simulating the effect of warm water patches on the formation of stratus/fog during inversion rising situations. However, the operational utility of the model is limited because the frequency of meteorological conditions during which the warm patch effect is important is very small. Author (GRA)

N81-33745# California Univ., Livermore. Lawrence Livermore Lab.
CAUSES OF CO2-INDUCED SENSITIVITY IN A ZONAL CLIMATE MODEL
M. C. MacCracken Jun. 1981 15 p refs Presented at the US/USSR Workshop on Carbon Dioxide and Climate, Leningrad, 15-19 Jun. 1981
(Contract W-7405-eng-48)
(DE81-023666; UCRL-85754; CONF-810687-1) Avail: NTIS HC A02/MF A01

The responses of climate models to increased concentrations of carbon dioxide depend on the interactions of a number of different processes. The separate and interacting roles of various feedback mechanisms can be identified by comparing the solar and terrestrial radiative fluxes calculated for the control simulation with those calculated when individual variables from a CO2-perturbed simulation are sequentially substituted for control values. In a simulation using the LLNL two-dimensional climate model, increased CO2 and water vapor and decreased surface albedo lead to a strong warming of the surface-troposhere system. Changes in cloud amount and distribution, however, lead to slight cooling, thereby helping to buffer the climate change induced by a doubling of CO2. The separately calculated effects can very nearly be linearly combined to arrive at the total climatic response. DOE

N81-33746# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Services and Supporting Research.
FEDERAL PLANS FOR COOPERATIVE BACKUP AMONG OPERATIONAL PROCESSING CENTERS
Feb. 1981 38 p
(PB81-212086; FCM-P14-1981; NOAA-81040601) Avail: NTIS HC A03/MF A01 CSCL 04B

The long standing cooperative arrangements involving the civil and military meteorological services are described. Emergency backup procedures for high priority user products in the event of extended power or computer outages are identified. Responsibilities of cooperating agencies, communications facilities and operational communications procedures for backup and routine communications are outlined. GRA

N81-33747# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
AN OBSERVATIONAL AND NUMERICAL STUDY OF THE ATMOSPHERIC BOUNDARY LAYER OVERLYING THE EAST ANTARCTIC ICE SHEET
W. D. Neff Feb. 1981 293 p refs
(PB81-211963; NOAA-TM-ERL-WPL-67; NOAA-81042116) Avail: NTIS HC A13/MF A01 CSCL 04B

Numerical study of the lowest few hundred meters of the atmosphere overlying the East Antarctic sheet is presented. The study is divided in two parts: (1) obtain and interpret new observations; (2) test and determine the limits of a simplified second order turbulence closure model when applied to these new data. An extension of the model is made to permit prediction of acoustic scattering cross sections. Observed scattering and wind profiles are compared with those predicted by the model. GRA

N81-33748# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
NATIONAL HURRICANE RESEARCH LABORATORY FISCAL YEAR 1980 PROGRAMS; FISCAL YEAR 1981 PROJECTIONS Annual Report
Jan. 1981 66 p
(PB81-211922; NOAA-81042110) Avail: NTIS HC A04/MF A01 CSCL 04B

Hurricane prediction and hurricane modification research is developed. Field programs in which sophisticated research aircraft penetrate hurricane circulations to make observations in the high energy cores of these storms are considered. The development of numerical models to simulate the behavior of hurricanes to foster improved understanding of these storms and to study their potential for beneficial modification is also discussed. GRA

N81-33749# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
THE ACQUISITION AND PROCESSING OF CONTINUOUS DATA FROM GMCC OBSERVATORIES

Gary A. Herbert, Joyce M. Harris, and James R. Jordan Jan. 1981 84 p refs
(PB81-211435; NOAA-TM-ERL-ARL-93; NOAA-81042113) Avail: NTIS HC A05/MF A01 CSCL 04B

The procedures used to process data in the geophysical monitoring for climatic change (GMCC) program are discussed. The overall breakdown is in data acquisition, processing and its distribution to the scientific community. Within each section, the flow of data will be considered in terms of input, processing, and output. Specifications of hardware components, details of computer programs and data sets are appended. GRA

N81-33750# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
THE FORMATION OF ELEVATED REFRACTIVE LAYERS IN THE OCEANIC BOUNDARY LAYER OF OFFSHORE MODIFICATION OF LAND AIR
Earl E. Gossard Dec. 1980 48 p refs
(PB81-211419; NOAA-TM-ERL-WPL-66; NOAA-81042112) Avail: NTIS HC A03/MF A01 CSCL 04B

Picture of the development of temperature and humidity boundary layers in a land air mass that moves offshore is shown to be very wrong under one type of Foehn condition in southern California, the Mediterranean Sea and the monsoonal regions of the Near East and Southeast Asia. A formalism is developed for analyzing the modification and graphical solutions for radio and optical ducting are given. It is shown that offshore modification can lead to elevated layers rather than surface based layers. Values of evaporation and heat flux into such an air mass are calculated and the distance offshore at which dew point depression becomes zero is predicted. GRA

N81-33751# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
NUMERICAL STUDIES OF THE INTERANNUAL VARIATIONS IN MERIDIONAL EDDY TRANSPORTS Final Report
Chi-Nan Hsiao and Elmar R. Reiter Feb. 1981 26 p refs
(Grant NOAA-04-7-022-44028)
(PB81-211278; ERP-30; NOAA-81040809) Avail: NTIS HC A03/MF A01 CSCL 04B

The international variability of the atmospheric eddy transports of momentum and sensible heat was investigated. The interannual variabilities of these two parameters are significant. A quasiperiodicity of 4 to 7 days of the fluxes of momentum and sensible heat was detected. It is suggested that dramatic changes of the transport of eddy sensible heat flux over the Pacific oceanic area are related with a change in the phase relationship of V^* and T^*. GRA

N81-33752# National Weather Service, Garden City, N.Y. Scientific Services Div.
AN AFOS VERSION OF THE FLASH FLOOD CHECKLIST
Cynthia M. Scott Mar. 1981 39 p
(PB81-211252; NOAA-NWS-ERCP-1; NOAA-81042111) Avail: NTIS HC A03/MF A01 CSCL 04B

Programs which produce an automated version of the flash flood checklist are outlined. The programs provide an accurate evaluation of the checklist parameters by directly accessing radiosonde observations in the AFOS data base. Forecaster input is minimal, consisting of a choice of station identifiers at an ADM. GRA

N81-33753# California Univ., Los Angeles. Dept. of Civil Engineering.
DISTANT AND LOCAL TSUNAMIS IN COASTAL REGIONS Final Report
Jiin-Jen Lee, S. T. Kin, R. M. Ayer, and J. J. Chang Dec. 1980 92 p refs
(Grant NSF ENV-77-01599)
(PB81-211047; NSF/RA-800511) Avail: NTIS HC A05/MF A01 CSCL 04B

The generation and propagation of tsunamis occurring in coastal regions were analyzed. Three subject areas are discussed: (1) the generation of water waves by three dimensional bed motion; (2) a viscous model for nonlinear dispersive waves; and (3) the propagation of linear periodic waves over submarine trenches. It is shown that three dimensional water surface profiles deviate significantly from two dimensional water profiles. GRA

N81-33754# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
PROJECT SEVERE ENVIRONMENTAL STORMS AND MESOSCALE EXPERIMENT: SESAME 1979 DATA USER'S GUIDE
Stanley L. Barnes Feb. 1981 247 p refs
(PB81-210684; NOAA-81042108) Avail: NTIS HC A11/MF A01 CSCL 04B

The severe environmental storms and mesoscale experiment (SESAME) 1979 field to predict severe thunderstorms and their attendant phenomena is described. A data base to initialize and test very fine mesh experimental numerical prediction models, and a data base which provides information about the interactions between thunderstorms and their environmental atmosphere are emphasized. GRA

N81-33755# Conference Management Associates Ltd., Washington, D.C.
WORKSHOP REPORT ON THE NATIONAL WEATHER MODIFICATION 5 YEAR PLAN
Cindy Marston 1980 20 p Workshop held in Tucson, Ariz., 15-16 May 1980 Sponsored in part by Federal Coordinating Council on Science, Engineering and Technology
(PB81-210643; NOAA-81041305) Avail: NTIS HC A02/MF A01 CSCL 04B

Summaries are included of the panel reports on: atmospheric issues, operations and applications, and societal studies. It is contended that societal studies are a critical part of the federal weather modification research and development program. They should include single, multiple and interdisciplinary studies with inputs from the followng nonmeteorological disciplines: agriculture hydrology, ecology and biology, economics, sociology, and law and government. GRA

N81-33756# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
HOMOGENEITY ANALYSIS OF SEASONAL MEANS TEMPERATURE SERIES AT 25 STATIONS AROUND THE GREAT LAKES
Daniel W. Gaskill Feb. 1981 20 p refs
(PB81-210437; NOAA-DR-ERL-GLERL-18; NOAA-81041001; NOAA-GLERL-Contrib-249) Avail: NTIS HC A02/MF A01 CSCL 04B

The homogeneity of seasonal mean temperature series at 25 stations around the Great Lakes were assessed. Historical documentation of inhomogeneities and graphical analysis and statistical tests for homogeneity are made for each station. When statistical tests are significant in at least one season, the magnitude of the inhomogeneity is estimated for all four seasons. GRA

N81-33757# Chicago Univ., Ill. Dept. of the Geophysical Sciences.
STUDY OF A SPLITTING ANVIL OVER IOWA ON MAY 15, 1977 USING 3-MINUTE SMS AND LEAR JET PICTURES
Duane J. Stiegler Oct. 1980 30 p refs
(Grant NOAA-80AA-D-00001)
(PB81-210015; SMRP-RR-168; NOAA-81042115) Avail: NTIS HC A03/MF A01 CSCL 04B

The storm was situated in an area of vigorous upper divergence and only slight low-level convergence. The split and subsequent decay is related to a strong horizontal shear associated with a passing mesoscale wave. Many such waves were evident in the analysis and showed a marked effect on cloud formation and dissipation. The waves were characterized by two north-south bands: a cloud (bright) band immediately followed by a cloud-free (dark) band. The 14 km band separation gives a measure of the half wavelength of the mesoscale wave. 6,480 cloud motion vectors were obtained using SMS pictures taken at 3 minute intervals. Most of the tracked low-level clouds are 0.7 to 2.0 mile cumulus turrets, which are likely to move with sub-cloud winds. GRA

N81-33758# Wisconsin Univ. - Madison. Dept. of Meteorology.
DIAGNOSTIC STUDIES OF BRAZIL CLIMATE: PRELIMINARY RESULTS

Pao-Shin Chu and Stefan Hastenrath Mar. 1981 61 p refs (Grant NOAA-79AA-D-00131)
(PB81-209983; NOAA-81042109) Avail: NTIS HC A04/MF A01 CSCL 04B

The project is focused on the tropical Atlantic sector. Project tasks and preliminary research results during October 1979-October 1980 are summarized. It was found desirable to have reference maps for the tropical Atlantic based on the same 5 degree blocks used in the diagnostic study of climate anomalies. Accordingly 60-year mean maps by calendar month were constructed for sea level pressure, zonal and meridional wind components, and sea surface temperature. In the effort towards the monitoring and prediction of Northeast Brazil droughts, the 1951-79 series of 700 mb contour maps published in the 'Monthly Weather Review' was evaluated. GRA

N81-33759# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
PYROHELIOMETER OBSERVATIONS AS AN INDICATOR OF THE CLIMATOLOGICAL PERSISTENCE CLOUDS M.S. Thesis - Colorado State Univ.
T.M. Thompson Feb. 1981 85 p refs
(PB81-209736; NOAA-TM-ERL-ARL-97; NOAA-81041506) Avail: NTIS HC A05/MF A01 CSCL 04B

The use of the NIP, which measures the direct beam solar radiation as a cloud detection device is explored. This instrument is deployed at 38 stations. Methods of expressing the normal incidence pyroheliometer (NIP) data in a climatologically meaningful manner were developed. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N81-33760*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
GULF OF MEXICO SATELLITE RADAR ALTIMETRY Final Report
C. G. Parra, R. G. Forsythe, and C. L. Parsons Aug. 1981 231 p refs
(NASA-TM-73295) Avail: NTIS HC A11/MF A01 CSCL 08C

The dynamic topography of the sea surface was measured. The radar altimeter measurements yield average ocean topographic data which are mapped. Seasonal deviations from a 3 year mean topography are presented. The altimeters are also instrumented with sample and hold gates which provide information about the shape and amplitude of the return waveform. Parameters including ocean surface wind speed and the significant wave height are determined. One hundred eighty six wind speed and significant wave height histograms are presented. E.A.K.

N81-33761# Naval Postgraduate School, Monterey, Calif.
AN EMBEDDED MIXED LAYER-OCEAN CIRCULATION MODEL Progress Report, Oct. 1977 - Sep. 1980
David Adamec, Russell Elsberry, Roland Garwood, Jr., and Robert L. Haney Dec. 1980 70 p refs
(AD-A095201; NPS63-80-003) Avail: NTIS HC A04/MF A01 CSCL 08/3

The rationale and numerical technique of embedding an oceanic bulk mixed layer model with a multi-level primitive equation model is presented. In addition to the usual prognostic variables that exist in a multi-level primitive equation model, the embedded model predicts the depth of the well mixed layer as well as the jumps in temperature and velocity that occur at the base of that layer. The depth of the mixed layer need not coincide with any of the fixed model levels used in the primitive equations calculations. In addition to advective changes, the mixed layer can deepen by entrainment and it can reform at a shallower depth in the absence of entrainment. When the mixed layer reforms at a shallower depth, the vertical profile of temperature below, the new, shallower mixed layer is adjusted to fit the fixed-level structure used in the primitive equations calculations using a method which conserves heat, momentum and potential energy. Finally, a dynamic stability condition, which includes a consideration of both the vertical current shear and the vertical temperature gradient, is introduced in place of the traditional 'convective adjustment'. A two dimensional version of the model is used to test the embedded model formulations and to study the response of the ocean to a stationary axisymmetric hurricane. The model results indicate a strong interdependence between vertical turbulent mixing and advection of heat. GRA

N81-33762# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
ATLANTIC COAST HINDCAST, DEEPWATER, SIGNIFICANT WAVE INFORMATION Final Wave Information Study Report
W. D. Corson, D. T. Resio, R. M. Brooks, B. A. Ebersole, and R. E. Jensen Jan. 1981 894 p
(AD-A095497; FWISR-2) Avail: NTIS HC A99/MF A01 CSCL 08/3

Using a numerical hindcast technique, deepwater, significant wave data (height, peak period, and direction) have been computed for the 20-year interval 1956 through 1975 for the U. S. Atlantic coast. The wave data are presented for 13 stations in 8 data products: (1) Percent Occurrence Tables; (2) Percent Exceedance Diagrams; (3) Duration Table; (4) Wave Rose Diagrams; (5) Height, Period, Direction Histograms; (6) Return Period Diagrams; (7) Steepness Diagrams; and (8) Mean and Largest Wave-Height Tables. A brief description of each product is given and some sections on use of the products, including examples, are provided. GRA

N81-33763# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C. Hydrographic/Topographic Center.
DERIVATION OF SHALLOW OCEAN BOTTOM REFLECTANCE VALUES FROM COLOR AERIAL PHOTOGRAPHY
Donald J. Gerson, Lynn K. Fehrenbach, Kenneth R. Piech, and David W. Gaucher Jun. 1981 22 p refs
(AD-A101105) Avail: NTIS HC A02/MF A01 CSCL 08/10

An alternative to the field survey method of acquiring hydrographic data is described. The technique involves the use of digitized color aerial photography in the derivation of the percentage of reflectance of shallow ocean bottom materials. These spectral reflectance values can then be used in an algorithm for calculating water depths. The reflectances that were derived in this study show a close relative comparison to ground truth information. After a discussion of the causes of discrepancies between derived and actual reflectance values, it is concluded that this method of data acquisition merits further investigation due to its high geometric fidelity, its simplicity, and its cost and time saving benefits. Author (GRA)

N81-33764# North Carolina Univ. at Chapel Hill.
THE GULF STREAM MEANDERS EXPERIMENT. CURRENT METER AND ATMOSPHERIC DATA REPORT FOR THE AUGUST TO NOVEMBER, 1979 MOORING PERIOD
David A. Brooks, John M. Bane, Robert L. Cohen, and Paul Blankinship (North Carolina State Univ. at Raleigh) May 1981 194 p refs Prepared in cooperation with Texas A and M Univ, College Station
(Contract N00014-77-C-0354; Grants NSF OCE-77-25682; NSF OCE-79-06710)
(AD-A103487; A/M-REF-81-3-T) Avail: NTIS HC A09/MF A01 CSCL 08/3

The principal objective of the Gulf Stream Meanders Experiment was to kinematically and dynamically describe the nature of meanders. The upper continental slope region off Onslow Bay, North Carolina was chosen for the experiment site because several previous investigations in that area provided a baseline data set giving some ideas about time and space variability scales within and a several-month mean view of the Stream. In addition, earlier observations ranging from reports in centuries-old ship logs to recent satellite infrared imagery made it apparent that Gulf Stream meandering was more intense between Charleston, South Carolina and Cape Hatteras, North Carolina. Author (GRA)

N81-33765# California Univ., Livermore. Lawrence Livermore Lab.
TWO-DIMENSIONAL MODELING OF THE OCEANS AND CO2 UPTAKE
J. A. Viecelli, H. W. Ellisaesser, and J. E. Burt (Illinois Univ. at Urbana) 15 Apr. 1981 22 p refs Presented at the Am. Chem. Soc. Ann. Meeting, 23-28 Aug. 1981, New York
(Contract W-7405-eng-48)
(UCRL-85673; CONF-810813-2) Avail: NTIS HC A02/MF A01

The possibility that additional carbon dioxide uptake by the oceans could be resulting from lattitude or depth variations in eddy mixing combined with the slow convective overturning of the deep waters and that the short run thermocline uptake rate is much greater than one would estimate on the basis of long term deep water C14 concentrations was examined by means of a crude lattitude dependent model. The model was used to examine the effects of lattitudinal variation in the thermocline eddy mixing rate and the effects of convective overturning on CO2 uptake. DOE

N81-33766# Florida State Univ., Tallahassee. Dept. of Meteorology.
A NUMERICAL MODEL OF COASTAL UPWELLING OFF PERU, INCLUDING MIXED LAYER DYNAMICS
George W. Heburn Dec. 1980 144 p refs
(Grants NSF OCE-78-00611; NSF ATM-79-20485)
(PB81-204919; NSF-IDOE-81-41) Avail: NTIS HC A07/MF A01 CSCL 08C

Two versions of a three dimensional, two layer, numerical model with realistic coastline and bottom topography on a Beta-plane were used to study the upwelling system off the Peruvian coast. A hydrodynamic version of the model with two homogeneous layers was used to examine the interaction between the bottom topography and coastal trapped waves. GRA

N81-33767# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
A COMPARISON OF THE MESA-PUGET SOUND OIL SPILL MODEL WITH WIND AND CURRENT OBSERVATIONS FROM AUGUST 1978 Final Report
Robert J. Stewart and Carol H. Pease Aug. 1980 65 p refs
(PB81-210965; EPA-600/7-80-168) Avail: NTIS HC A04/MF A01 CSCL 08C

The winds and currents in the Strait of Juan de Fuca were compared with simulated wind and current fields taken from the MESA Puget Sound oil spill model. A method is developed to relate these errors in velocity to uncertainties in predicted position. It is shown that the uncertainty in trajectory position is strongly affected by the inability to predict the baroclinic motions in the region. It is concluded that over small times, the dispersion is mainly tidal, and the tidal current subprogram contributes importantly to the prediction of position. GRA

N81-33768# Woods Hole Oceanographic Institution, Mass.
MECHANISMS OF HEAT TRANSPORT THROUGH THE FLOOR OF THE EQUATORIAL PACIFIC OCEAN Ph.D. Thesis
John Crowe May 1981 236 p refs
(Grant NSF OCE-79-02792)
(PB81-215527; WHOI-81-47) Avail: NTIS HC A11/MF A01 CSCL 08J

The equatorial Pacific heat flow low, a major oceanic geothermal anomaly centered on the equatorial sediment bulge, was investigated using deeply penetrating heat flow probes within three detailed surveys and over 10,000 km of continuous siesmic profiles. Measurements verify the anomalous nature of the heat flux and also define nonlinear temperature gradients. A simple model incorporating heat transport by both conduction and fluid convection through the sediments fits the observations. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N81-33769 Materials Research Labs., Melbourne (Australia).
A COMPARISON OF POSSIBLE METHODS FOR MARINE FOULING ASSESSMENT DURING RAFT TRIALS
John A. Lewis Apr. 1981 27 p refs
(MRL-R-808; AR-002-406; NAV-79/137; DST-77/006)
Copyright. Avail: Materials Res. Labs., P.O. Box 50, Ascot Vale, Vic. 3032

Fouling settlement data from HMAS STIRLING (Western Australia), the North Barnard Islands (North Queensland) and Williamstown (Victoria) were to evaluate the suitability of different methods for settlement. Density, cover, frequency and biomass were measured to assess the abundance of settlement on panels immersed during raft trials. Frequency was the most suitable measure of individual species abundance for comparisons. It is found that panel cover and biomass are better indices of total fouling abundance than either density or frequency. E.A.K.

N81-33770# Mitre Corp., McLean, Va. Metrek Div.
EVALUATION OF SHORT-TERM BIOASSAYS TO PREDICT FUNCTIONAL IMPAIRMENT, DEVELOPMENT OF NEURO-BEHAVIORAL BIOASSAYS IN LABORATORY ANIMALS, DIRECTORY OF INSTITUTIONS/INDIVIDUALS Final Report, Sep. 1978 - Jul. 1980
Purna Greenaway and James Konz Oct. 1980 106 p
(Contract DAMD17-78-C-8068; DA Proj. 3E1-61102-BS-04)
(AD-A104225; WP-79W00681) Avail: NTIS HC A06/MF A01 CSCL 06/20

This directory catalogues the organizations currently engaged in neurobehavioral bioassay utilization or development and provides information concerning specific measurements performed, test systems employed and compounds tested for the U.S. Army Medical Bioengineering Research and Development Laboratory. Author (GRA)

N81-33771# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 15, NO. 4, JULY - AUGUST 1981
28 Sep. 1981 155 p refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 (JPRS-79085) Copyright. Avail: Issuing Activity

The physiological effects of various exobiological phenomena are discussed. Emphasis is placed on: hemodynamic response; lower body negative pressure; and orthostatic tolerance. For individual titles, see N81-33772 through N81-33803.

N81-33772# Joint Publications Research Service, Arlington, Va.
LINEAR DISCRIMINANT FUNCTION USED TO ASSESS COSMONAUT REACTION TO LBNP c52
A. D. Voskresenskiy, V. A. Degtyarev, V. G. Doroshev, N. I. Vikhrov, Zh. V. Barsukova, and N. A. Lapshina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 1-4 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 4-6 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

Efforts were made to formalize the procedure of summarizing data collected from the measurement of hemodynamic parameters during the lower back negative pressure (LBNP) test. It is shown that linear discriminant function can be used to rate reactions to LBNP. Major emphasis was placed on the acquisition of effective linear discriminant functions to assess the reactions to LBNP from the results of examining cosmonauts who have performed long term orbital flights. R.C.T.

N81-33773# Joint Publications Research Service, Arlington, Va.
COMPARISON OF DIRECT AND INDIRECT METHODS OF MEASURING CARDIAC OUTPUT c52
V. G. Doroshev, N. N. Popov, V. P. Katuntsev, N. A. Lapshina, O. B. Kulikov, G. K. Chizhov, V. A. Galichiy, K. S. Yurova, and R. I. Finogenova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 5-8 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 7-9

(For primary document see N81-33771 24-51)
Avail: Issuing Activity

Cardiac output was measured in anesthesized dogs directly (by the method of Fick and by electromagnetic flowmetry) and indirectly (by the method of Bremser-Ranke and by rheography). The measurements were carried out before and after drug tests. The absolute values of cardiac output at rest differed depending on the method used. After the drug test, all the methods revealed distinct changes in cardiac output. A good correlation between flowmetric and rheographic methods was demonstrated. Results indicated that both methods can be used in rapidly changing hemodynamic situations. The method of Bremser-Ranke proved more suitable for the processes developing within 30-40 seconds. R.C.T.

N81-33774# Joint Publications Research Service, Arlington, Va.

EFFECT OF NEGATIVE PRESSURE AND OCCLUSION CUFFS ON INTRAVASCULAR PRESSURE IN LEGS OF HEALTHY MAN **c52**

V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, and V. V. Rumyantsev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 9-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 9-12 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

The effect of local negative pressure on the leg (with a bladder sealed above the knee) and occlusion cuffs (located as close as possible to Poupart's ligament) on the leg intravascular pressure was investigated in recumbency. Eight healthy volunteers participated in two experimental runs. Each of the two exposures was used at two levels: local negative pressure at -50 and -100 mm Hg; and occlusion cuffs at +40 and +50 Hg with exposure time averaging 5-7 min. Catheters were inserted into the femoral artery and vein, and arteries and veins of the back of the foot. The arterial pressure remained unchanged during both exposure (local negative pressure and occlusion cuffs). Upon exposure to local negative pressure the venous pressure in the back of the foot (with respect to the atmospheric pressure) did not change and in the femoral vein decreased. Upon exposure to occlusion cuffs the venous pressure in the back of the foot increased noticeably and in the femoral vein decreased slightly. R.C.T.

N81-33775# Joint Publications Research Service, Arlington, Va.

EFFECT OF LOWER BODY NEGATIVE PRESSURE (CHIBIS GARMENT) AND LOCAL NEGATIVE PRESSURE ON CENTRAL CIRCULATION IN HEALTHY MAN **c52**

V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, V. V. Rumyantsev, and Ye. V. Kolpakov *In* Its USSR Rept.: Space Biol. and Aerospace Med. Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) p 14-21 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 13-18 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

Catheters were chronically implanted into pulmonary and radial arteries of 8 healthy volunteers to examine the effect of lower body negative pressure (LBNP in the Chibis suit) and local negative pressure on the leg on central circulation, oxidative metabolism and acid base equilibrium in the blood. In 1 hour head down tests (at -20 deg) the effect of two regimens of LBNP (at -30 and -60 mm Hg) was studied, each exposure averaging 15-20 min. Both LBNP and local negative pressure induced changes in central circulation that were similar qualitatively and dissimilar quantitatively. Author

N81-33776# Joint Publications Research Service, Arlington, Va.

USE OF NUTRIENTS TO CORRECT THE ADRENOCORTICAL SYSTEM **c54**

S. Kalandarov, V. P. Bychkov, I. D. Frenkel, and T. P. Petukhova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 22-26 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 19-22 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

Two 60 day studies in which 10 healthy volunteers participated were carried out. In both studies stress situations were simulated by a chamber rise to an altitude of 8000 m, anticipation of exposure to acceleration, and psychological tests. The changes found were dependent on both the type of the stressor applied and duration of the exposure. Results indicate that nutrient supplements did not influence the adrenocortical function of the adrenals. R.C.T.

N81-33777# Joint Publications Research Service, Arlington, Va.

ECHOVENTRICULOMETRY USED TO STUDY SPINAL FLUID CIRCULATION DURING REDISTRIBUTION OF FLUIDS IN A CRANIAL DIRECTION **c52**

V. I. Sokolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 27-29 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 22-23 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

The possibility of evaluating intracranial spinal fluid pressure by means of echoventriculometry is discussed. Major consideration is given to the capability of the technique to evaluate the functional and adaptive mechanisms involved in maintaining cerebral hemodynamics and dynamics of spinal fluid. Significant results are reported. R.C.T.

N81-33778# Joint Publications Research Service, Arlington, Va.

EFFECT OF ONE DAY IMMERSION ON CARDIORESPIRATORY PARAMETERS OF MAN DURING EXERCISE **c52**

S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 30-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 24-26 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

The effect of 1 day water immersion (dry immersion) on cardiorespiratory parameters of test subjects performing submaximal exercises was studied. Individual changes involving increases in heart rate and cardiac load index, and decreases in oxygen pulse and systolic volume were observed. These changes suggest a decline of adaptive ability of the human body to muscular loads after 1 day water immersion. R.C.T.

N81-33779# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA IN HEAD DOWN POSITION ON MAN'S EQUILIBRIUM FUNCTION **c52**

A. R. Kotovskaya, L. N. Gavrilova, and R. R. Galle *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 34-38 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 26-29 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

Six test subjects participating in a 182 day head down study at -4 deg were examined stabilographically before and during the test. During the first 30 days the subjects showed impaired equilibrium which later was relatively stabilized. continuation of the bed rest study did not impair drastically stability of upright standing. It was shown that the contribution of optic sensors into the recovery of the equilibrium function increased during the second half of the bed rest study. Provocative tests suggest that bed rest related impairment of equilibrium occurs due to vestibular changes and deconditioning. R.C.T.

N81-33780# Joint Publications Research Service, Arlington, Va.

PROGNOSTIC VALUE OF BLOOD CHOLESTEROL LEVEL IN HEALTHY SUBJECTS **c52**

V. V. Vlasov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 39-43 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 30-33 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

An hypothesis was developed which states that normal values (reference values for healthy individuals) can be statistically formed by screening a random group of people or even as a characteristic of a certain heterogeneous random clinical group (reference group). The records of in hospital examination of 355 pilots and navigators between the ages of 34-36 and 33-41 years were studied. Blood cholesterol level was selected as the analyzed parameter. Results indicate that blood cholesterol concentration in healthy flight personnel 35 years of age differs from the recommended reference range and constitutes 5.78 + or - 0.73 mM/1. Other significant results are reported. R.C.T.

N81-33781# Joint Publications Research Service, Arlington, Va.

EFFECT OF EXERCISE ON REACTIONS TO BREATHING A GAS MIXTURE WITH 5% CARBON DIOXIDE AND 14% OXYGEN **c52**

N. P. Krasnikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 44-47 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 33-35 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The effect of a hypoxic hypercapnic gas mixture (5% CO2 + 14% O2) on the exercising man was studied. At a low work load inhalation of this gas mixture inhibited gas exchange, and after 10 month training stimulated it. Increase in physical endurance was followed by increase in human resistance to O2 deficiency and CO2 excess in the breathing mixture. Author

N81-33782# Joint Publications Research Service, Arlington, Va.

SENSITIVITY TO ANTIBIOTICS OF LACTOBACILLI FROM DIGESTIVE TRACT OF SOYUZ-13 AND SALYUT-4 CREW MEMBERS

A. A. Lentsner, M. E. Tyur, Kh. P. Lentsner, M. E. Mikelsaar, V. M. Shilov, N. N. Lizko, and G. D. Syrykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 83-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 36-39 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

Sensitivity to 10 antibiotics of 411 lactobacillar strains isolated from the saliva and feces of crewmembers who made 8, 30 and 63 day flights was determined. Antibiotic sensitivity remained unchanged even in the 63 day flight. The antibiotics tested produced different effects on the lactoflora that varied from gentle polymyxin and gentamycin, less gentle neomycin and monomycin, to hazardous pencillin and erythromycin, then rifampicin and levomycetin, and, finally, tetracyclin and oleandomycin. Author

N81-33783# Joint Publications Research Service, Arlington, Va.

STUDY OF DIGESTIVE TRACT MICROFLORA OF SOYUZ-13 AND SALYUT-4 CREWS **c52**

A. A. Lentsner, Kh. P. Lentsner, M. E. Mikelsaar, V. M. Shilov, N. N. Lizko, G. D. Syrykh, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 48-52 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 39-43 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The species composition and biology of lactoflora of the saliva and feces of crewmembers from 8, 30 and 63 day flights was investigated. Altogether 593 strains of lactobacilli were examined. The space flights did not cause significant changes in physiology, biochemistry, antagonistic properties or lysozyme activity of lactobacilli. They did not change drastically or unify the species composition of the digestive lactoflora. However, transfer of lactobacilli from one crewmember to another cannot be excluded, its probability increasing with flight time. Author

N81-33784# Joint Publications Research Service, Arlington, Va.

EFFECTIVENESS OF DECOMPOSITION OF PLANT WASTE BY MICROORGANISMS UNDER AEROBIC CONDITIONS **c52**

I. L. Chernovich, L. M. Sidorova, and N. A. Maltseva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 53-59 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 44-45 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

Degradation of plant wastes by means of microbial coenosis under aerobic conditions was studied. Efficiency of the process increased with increase in time and temperature. Microbial degradation of vegetable wastes was more complete than that of wheat wastes. Author

N81-33785# Joint Publications Research Service, Arlington, Va.

EFFECT OF SEX HORMONES ON SOME PARAMETERS OF CARBOHYDRATE METABOLISM IN THE LUNGS OF HYPOXIC RATS

N. N. Pribylova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 60-62 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 45-48 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

Experiments were carried out to reveal changes in the content of glucose, glycogen, pyruvate and lactate and in the activity of hexokinase and lactate dehydrogenase in the lungs of white rats exposed to 7 and 35 day hypoxia (rise to 9000 m for 6 hours daily) and treated with progesterone and testosterone. Treatment with the steroid hormones during chronic hypoxia increased the pulmonary content of glucose, glycogen, pyruvate, and decreased hexokinase activity and lactate accumulation. Author

N81-33786# Joint Publications Research Service, Arlington, Va.

EFFECT OF CHRONIC GAMMA IRRADIATION ON PROTEIN COMPOSITION AND CHOLESTEROL CONTENT OF CANINE BLOOD

A. A. Akhunov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS) 28 Sep. 1981 p 63-67 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 48-50 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

In a chronic experiment dogs were exposed to radiation in doses of 190, 360, and 560 rad for 3 years. As compared to the unradiated controls they showed a slower recovery of the albumin and cholesterol content in the blood. The cholesterol content varied, depending on the dose of chonic irradiation, whereas the protein content did not show such a correlation Author

N81-33787# Joint Publications Research Service, Arlington, Va.

EFFECT OF STATIONARY MAGNETIC FIELD ON THE THYROID

V. M. Katola, A. D. Chertov, V. I. Kirichenko, A. B. Priogov, and V. I. Molchanov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 68-70 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 50-52 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

Rats were exposed to a constant magnetic field of 26268 A/m. Depending on the exposure time, the thyroid gland showed changes in the follicular epithelium height, content of ribonucleoproteins and PAS-positive substance, activity of adenylate cyclase, whereas blood serum exhibited changes in the concentration of thyroid hormones and no changes in the content of thyrotropic hormone. Author

N81-33788# Joint Publications Research Service, Arlington, Va.

MECHANISM OF ADRENOSYMPATHETIC SYSTEM REAC-

TION TO SINGLE EXPOSURE TO VARIABLE MAGNETIC FIELD

S. A. Sakharova, A. I. Ryzhov, and N. A. Udintsev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 71-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 52-56 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

In view of the complex nature and functional correlation between the adrenosympathetic system (ASS) and central nervous system, glucocorticoid function of the adrenals and catecholamine (CA) reserves, the role of these relationships in formation of the response of the ASS to a variable magnetic field (VMF) was investigated. Phenobarbital was used to exclude the central nervous system. Rausedyl was used to mobilize reserve catecholamines; dexasone induced compensatory atrophy of the adrenal cortex; after splanchnotomy, visible vessels and the lipid capsule were swabbed with formalin. The reaction of the ASS to VMF was absent in experiments where phenobarbital and rausedyl were administered and splachnotomy performed, whereas with administration of dexasone only a mediator part was not involved in the reaction. Experiments with rausedyl demonstrated that the CA reserve levels in organs play an important role in formation and degree of ASS reaction to the stressor, whereas the hemodynamic and morphological changes in cellular elements of organs induced by the field were related to mobilization of reserve CA. M.G

N81-33789# Joint Publications Research Service, Arlington, Va.

EFFECT OF ATTENUATED GEOMAGNETIC FIELD ON E. COLI RESISTANCE TO ULTRAVIOLET RAYS

O. A. Alferov and T. V. Kuznetsova *In its* USSR Rept. Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 74-79 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 57-58 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The effect of an attenuated geomagnetic field on E. coli tolerance to ultraviolet irradiation was studied. The geomagnetic field was shielded to provide 40- and 160-fold attenuation. It was demonstrated experimentally that the 160-fold attenuated field increased E. coli tolerance, whereas the 40-fold attenuated field decreased it. The geomagnetic effect depended on the exposure time, reaching maximum after five passages of E. coli. An additional magnetic field smulating the geomagnetic field generated in a shielded chamber reversed the effect of an attenuated geomagnetic field. M.G.

N81-33790# Joint Publications Research Service, Arlington, Va.

EFFECT OF FLIGHT ABOARD COSMOS-936 BIOSATELLITE ON CONTRACTILE PROPERTIES OF RAT MUSCLE FIBERS

V. S. Oganov, S. A. Skuratova, and M. A. Shirvinskaya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 80-82 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 58-61 (For primary document see N81-33771 24-51)

Contractile properties of glycerinated fibers of skeletal muscles of rats flown for 18.5 days on Cosmos-936 were investigated. In slow antigravitational muscles (soleus m. and triceps brachii m.), decrease in the amplitude of isometric tension and performance as well as acceleration of the contraction development were observed. A high specificity of reactions of skeletal muscles to the experimental conditions is indicated, depending on their functional specialization. It is suggested that changes in contractile properties of myofibrillar proteins may contribute to the adaptive rearrangement of functional properties of antigravitational muscles under the influence of space flight. M.G.

N81-33791# Joint Publications Research Service, Arlington, Va.

ARTIFICIAL GRAVITY AS A MEANS OF PREVENTING ATROPHIC SKELETAL CHANGES

G. P. Stupakov *In its* USSR Rept: Space Biol. and Aerospace Med, Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 88-90 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 62-63 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The efficacy of artificial gravity, created by an onboard centrifuge in the Cosmos-936 biosatellite, as a means of preventing development of osteoporosis in weightlessness was tested. The results indicated that exposure of rats to artificial gravity of 1 g can prevent development of osteoporosis. M.G.

N81-33792# Joint Publications Research Service, Arlington, Va.

STATES OF CATECHOLAMINES AND ENZYMES OF SYNTHESIS THEREOF IN THE ADRENAL MEDULLA OF RATS AFTER FLIGHT ABOARD COSMOS-936 BIOSATELLITE

R. Kvetnyanski, T. Torda, R. A. Tigranyan, Yu. Chulman, and A. M. Genin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 91-93 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 64-65 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

In the adrenals of weightless and centrifuged rats flown for 18.5 days onboard the biosatellite Cosmos-936, indicators of the activity of the adrenomedullary system, i.e., the content of catecholamines and activity of the enzymes involved in their synthesis (tyrosine hydroxylase and dopamine-beta-hydroxylase) were measured. It was found that none of the indicators changed postflight. These findings show that a prolonged exposure of rats to weightlessness does not act as a strong stressor for the adrenomedullary system. M.G.

N81-33793# Joint Publications Research Service, Arlington, Va.

FLOUR BEETLE REPRODUCTION AND MUTABILITY IN WEIGHTLESSNESS (EXPERIMENTS ABOARD SALYUT-6 ORBITAL STATION)

G. P. Parfenov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 94-100 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 66-70 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The effects of weightlessness on reproduction and mutability in beetles were investigated. Experiments with the flour beetle Tribolium castaneus showed that in weightlessness these insects completed their cycle of development--from fertilization to the emergence of mature imago of the next generation--in the normal way. Survival of specimens, densities of cultures, duration of development, and frequency of morphoses in flight and control studies were similar. Exposure to weightlessness did not increase the number of genetic changes. M.G.

N81-33794# Joint Publications Research Service, Arlington, Va.

COMPUTER USE FOR AUTOMATIC MEASUREMENT OF SOME PHYSIOLOGICAL PARAMETERS **c52**

V. A. Degtyarev, N. M. Zhurba, Yu. A. Kukushkin, V. G. Doroshev, and N. A. Lapshina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 101-106 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 70-73 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The possibility of automatic processing of some hemodynamic parameters included in the set of medical monitoring methods for manned orbital station crews was investigated. The physiological parameters of sphygmograms of the carotid, radial, and femoral arteries; kinetocardiograms; tachoscillograms; and electrocardiograms were recorded synchronously with an onboard Polynome-2M apparatus. These curves were then interpreted automatically and the hemodynamic parameters were calculated with a computer. The algorithms are described in some detail. M.G.

N81-33795# Joint Publications Research Service, Arlington, Va.

METHOD FOR EVALUATING RESPIRATORY SYSTEM REACTION TO INCREASING HYPERCAPNIA c52

L. A. Ivanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 107-111 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, July. - Aug. 1981 p 74-76 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The methodology and results of an experiment to test the effect of progressive hypercapnia on pulmonary ventilation are described. According to this method, the subject breathes from a spirograph, from which the CO2 absorber is removed. A carbograph is connected in parallel with the spirograph in order to record CO2 concentration concurrently with pulmonary ventilation. One finds the points in the system of coordinates characterizing the correlation between partial CO2 tension in alveolar air and minute volume by plotting the former on the x-axis and the corresponding later on the y-axis. By drawing a line through these points, one obtains a curve of minute volume as a function of PACO2, which reflects the reaction of the respiratory center to CO2. The intersection of this line on the x-axis corresponds to the point that characterizes PACO2 level, at which ventilation equals zero (sensitivity of the respiratory center to CO2). M.G.

N81-33796# Joint Publications Research Service, Arlington, Va.

LOG-LINEAR REGRESSION METHOD USED TO ASSESS QUALITY OF AIR SAMPLES IN FLUOROPLASTIC CONTAINERS c54

V. Ye. Ryzhkova, Ye. N. Kulkov, and K. N. Mikos *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 112-115 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 76-78 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The possibility of using fluoroplastic containers for storage of air samples containing traces of organic matter was investigated. Gas chromatographic analysis of samples from containers was performed immediately after they were filled with a mixture, after 4, 6, 8, and 24 hours on the first day, then once a day for 10 days. The results show that there was virtually no change in concentrations of saturated hydrocarbons (methane, ethane) during storage. There was exponential change in levels of oxygen-containing organic substances (methanol, ethanol, acetone, and ethyl acetate). The change as particularly intensive in the first 6 hours. Regression analysis was performed to demonstrate dependence of concentration on storage time. A log-linear regression model was constructed using the least squares method. M.G.

N81-33797# Joint Publications Research Service, Arlington, Va.

AGE-RELATED CHANGES IN BODY AND VISCERAL WEIGHT OF WISTAR RATS

G. I. Plakhuta-Plakutina, Ye. I. Alekseyev, G. N. Durnova, Ye. I. Ilina-Kakuyeva, A. S. Kaplanskiy, A. S. Pankova, Ye. A. Savina, V. N. Shvets, and V. I. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 116-120 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 79-81 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The patterns of growth of the body, absolute and relative weight of internal organs, endocrine glands, different muscles, and linear parameters of the skeleton of the Wistar rat were investigated. The results indicate that rats grow the most intensively up to the 80th to 90th day of postnatal ontogenesis. Starting in the third month of life there is some stabilization of the relative weight of internal organs. It is recommended to use animals from the age of 3 months in experiments conducted to investigate the effects of various extreme factors on the adult organism. Additional recommendations are given. M.G.

N81-33798# Joint Publications Research Service, Arlington, Va.

METHOD OF TESTING WHITE RAT ELEVATOR RESPONSE

G. S. Ayzikov, A. S. Markin, A. V. Mokrousova, and I. Yu. Sarkisov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 121-124 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 82-84 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

A device to study the latency period of the elevator reaction (LPER) of white rats is described in detail. The device was developed in accordance with a program of inflight experiments aboard Cosmos-936 and Cosmos-1129 to analyze the state of vestibulomotor reactions of animals. M.G.

N81-33799# Joint Publications Research Service, Arlington, Va.

SUBCUTANEOUSY IMPLANTED CONNECTOR TO RECORD ARTERIAL PRESSURE AND MAKE ELECTRICAL CONTACT

Yu. Ya. Gaich, V. S. Baranov, V. V. Suchkov, and O. S. Medvedev *In its* USSR Rept. Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 125-217 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 84-85 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The design of a catheter, with a nipple connector on the end, which is completely implanted under the skin is described. The connector could, with minor alteration of design, be used to provide temporary electrical contact. M.G.

N81-33800# Joint Publications Research Service, Arlington, Va.

METHOD FOR ATTACHING CEREBRAL THERMOCOUPLE WIRES TO THE DOG'S SKULL

O. Ye. Ozerova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 128-130 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 85-86 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

A method for attaching brain thermocouple wires to the dog's skull, which would make it possible to retain natural heat insulation of the brain, is discussed. The hardware and surgical procedures are described in detail. M.G.

N81-33801# Joint Publications Research Service, Arlington, Va.

METHOD FOR EVALUATING RESPIRATORY SYSTEM REACTION TO INCREASING HYPERCAPNIA c52

L. A. Ivanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 107-111 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, July. - Aug. 1981 p 74-76 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

The methodology and results of an experiment to test the effect of progressive hypercapnia on pulmonary ventilation are described. According to this method, the subject breathes from a spirograph, from which the CO2 absorber is removed. A carbograph is connected in parallel with the spirograph in order to record CO2 concentration concurrently with pulmonary ventilation. One finds the points in the system of coordinates characterizing the correlation between partial CO2 tension in alveolar air and minute volume by plotting the former on the x-axis and the corresponding later on the y-axis. By drawing a line through these points, one obtains a curve of minute volume as a function of PACO2, which reflects the reaction of the respiratory center to CO2. The intersection of this line on the x-axis corresponds to the point that characterizes PACO2 level, at which ventilation equals zero (sensitivity of the respiratory center to CO2). M.G.

N81-33802# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOXIA ON AFFINITY OF HEMOGLOBIN FOR OXYGEN IN ANIMALS

V. V. Gladilov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 134-136 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 88-89 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

The effect of hypoxia on the oxygen-binding property of hemoglobin was examined with a particular concern for the role of 2,3-diphosphoglycerinic acid as the oxygen-affinity regulator. Since the level of this phosphate in the blood of animals of different species and age is not the same, cats, rabbits, and hamsters of differing ages were used. M.G.

N81-33803# Joint Publications Research Service, Arlington, Va.

CHANGES IN RABBIT IMMUNOREACTIVITY AS RELATED TO DURATION OF HYPOKINESIA

V. V. Tyavokin, V. N. Sizov, G. V. Magnitskalya, and Ye. A. Dleynikova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 137-139 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 90-91 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

The effects of hypokinesia differing in duration and readaptation period on the body's nonspecific defense factors were examined. The tests to dertermine the intensity of spontaneous immunity included: bactericidal, lysozyme, beta-lysine, blood serum complement activity and neutrophil phagocytic reaction, which consisted of phagocytotic activity, intensity and completion of phagocytosis. M.G.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N81-33804*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NON-INVASIVE METHOD AND APPARATUS FOR MEASURING PRESSURE WITHIN A PLIABLE VESSEL

Masashi Shimizu 19 Feb. 1981 14 p
(NASA-Case-ARC-11264-1; US-Patent-Appl-SN-235866) Avail: NTIS HC A02/MF A01 CSCL 06B

A non-invasive method and apparatus for measuring pressure within a pliable vessel such as a blood vessel are described. The blood vessel is clamped by means of a clamping structure having a first portion housing a pressure sensor, and a second portion extending over the remote side of the blood vessel for pressing the blood vessel into engagement with the pressure sensing device. The pressure sensing device includes a flat deflectable diaphragm portion arranged to engage the blood vessel. In one embodiment, the clamp structure includes first and second semicylindrical members held together by retaining rings. In a second embodiment the clamp structure is of one piece construction having a solid semicylindrical portion and a hollow semicylindrical portion with a longitudinal slot in the hollow semicylindrical portion through which to slip the blood vessel. In a third embodiment, an elastic strap is employed for clamping the blood vessel against the pressure sensing device. NASA

N81-33805# Cornell Univ., Ithaca, N. Y.

PRIMARY EVENTS IN VISION Final Technical Report

Aaron Lewis 27 Sep. 1980 16 p
(Contract N00019-79-C-0621)
(AD-A095369) Avail: NTIS HC A02/MF A01 CSCL 06/16

This report focuses on the fundamental mechanisms by which light energy is converted into a neural response in visual photoreceptor cells. Research in this area has approached the stage that permits the piecing together the molecular mechanisms between absorption of light and the generation of a neural response. Consideration is given to the primary molecule of visual photoreception--rhodopsin. The molecule is composed of a form of vitamin A which is called retinal, and this form of vitamin A is connected through a Shiff base-nitrogen linkage to a membrane glycoprotein matrix called opsin. The combination of retinal and opsin is called rhodopsin. The question of light absorption by rhodospin is discussed. It has been generally accepted that retinal interaction indeed undergoes structural alteration between rhodopsin and bathorhodopsin. A new aspect represented by the above mechanism is a movement of the proton in the protein. Measurements indicated that, as a result of the absorption of light, one of the first molecular events is the motion of a proton, and this is probably the first ion movement that is initiated by the rhodopsin molecule. Other experiments, are showing that there are several other chemical species activated by the absorption of light in the rhodopsin molecules. GRA

N81-33806# Naval Medical Research Inst., Bethesda, Md.

HUMAN ENGINEERING EVALUATION OF THE HYPERBARIC RESEARCH FACILITY Final Report

J. I. Brady and M. D. Curley Jul. 1981 69 p refs
(AD-A103681; NMRI-81-47) Avail: NTIS HC A04/MF A01 CSCL 14/2

The human engineering evaluation and human factors deficiencies were studied. Recommendations for alterations or additions were made which are grouped under the headings of: work place or watch station, environment, personnel; and emergency systems. The majority of recommendations dealt with control panel layouts, functional grouping, gauge placement, and chamber habitability. At the present time, the most serious problem identified is the exocessive noise levels in the control area of the chambers. Octave band analysis reveals that: (1) the primary noise sources are the life support loops and the building air conditioning system, and (2) because of the frequency distribution of the noise, ear protectors are not a viable solution since the peak noise levels fall in the same frequency range as the peak levels in male speech. Light levels throughout the complex generally fall within acceptable limits. The necessity for increased manpower is recommended. The HRF's emergency system displays high attention getting value through both auditory and visual alarms, and good readability. E.A.K.

N81-33807# California Univ., San Diego.

MEASURING SLEEP BY WRIST ACTIGRAPH Annual Report, 1 Apr. 1980 - 31 Mar. 1981

Daniel F. Kripke, John B. Webster, Daniel J. Mullaney, Sam Messin, and William Mason Mar. 1981 34 p refs
(Contract DAMD17-78-C-8040)
(AD-A103196; AR-3) Avail: NTIS HC A03/MF A01 CSCL 06/16

A method of monitoring personnel sleep and activity in field conditions needed to promote medical planning for modern combat was investigated. A wearable digital activity system was programmed, tested, and evaluated. A computer process for recognizing sleep from this system was defined. The systems allow collection of data from freely ambulatory subjects who can be scored automatically for sleep/wake with accuracy comparable to EEG scoring. The microprocessor based digital activity monitor is built to specifications, and external activity and illumination transducers are added. Since the errors that occur include both misscoring sleep as wake and vice versa, they tend to cancel. It is concluded that design criteria for a miniaturized wrist mounted activity monitor are suitable for field or combat use. E.A.K.

N81-33808# School of Aerospace Medicine, Brooks AFB, Tex.

A FAST WALSH TRANSFORM ELECTROCARDIOGRAM DATA COMPRESSION ALGORITHM SUITABLE FOR MICROPROCESSOR IMPLEMENTATION Final Report, Jun. - Aug. 1980

Walter S. Kuklinski and Al M. Zied Jun. 1981 27 p refs
(AF Proj. 7755)
(AD-A104115; SAM-TR-81-13) Avail: NTIS HC A03/MF A01 CSCL 06/5

The feasibility of using a sequency-ordered Fast Walsh transform algorithm in a transformation-type ECG data compression scheme was demonstrated. The relationship of the mean square error between the original and reconstructed ECG signals as a function of the number of Walsh coefficients retained and the number of bits used to represent each coefficient was determined. A finite impulse response digital low-pass filter was

tested as a means of improving the diagnostic characteristics of the reconstructed ECG waveforms. Suggestions for further work in this area are included. Author (GRA)

N81-33809# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.

AEROSOL FACTORS AFFECTING RESPIRATORY DEPOSITION

P. E. Morrow 1981 13 p refs Presented at the Conf. on Deposition and Clearance of Aerosols in the Human Respiratory Tract, Bad Gleichenberg, Austria, 22 May 1981

(Contract DE-AC02-76EV-03490)

(DE81-024425; UR-3490-2026; CONF-810594-1) Avail: NTIS HC A02/MF A01

Aerosol deposition in the human respiratory system results from the interaction of the physical properties of the aerosol particles, the constantly changing dynamic character of the respired air, and the special architecture of the conducting airways and pulmonary parenchyma. These aspects fall into two categories: those derived from the aerosol and those associated with the human respiratory system, per se. Particle size is the most significant and in this respect, specifically, the hygroscopicity of particles and the heterodispersity of aerosols. Hygroscopicity is discussed in the context of the inconsistent data on respiratory humidification and temperature and their impact on hygroscopic growth models and particulate deposition estimations. Heterodispersity of aerosols considers the application of several models of respiratory functional anatomy and of aerosol deposition. The mass deposition estimates based on monodisperse particles and these models were found to be satisfactory for heterodisperse aerosols. DOE

N81-33810# ELMED G.m.b.H., Augsburg (West Germany).

ECG-CONVERTER Final Report

Wolfgang Mueller Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 23 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-111; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4,80

A conversion unit was designed which makes it possible to display a person's heart signal on the screen of a normal television (TV) receiver. The ECG signals, picked up from the patient, are amplified and then digitalized and stored in a high speed random access memory (RAM). This RAM is cyclically read out so that for each line of the TV picture, the total content is checked once. The complete content is fed to a comparator where it is compared with the line valence. In the case of equality, a dot is written at that place in the line. The analog signal is converted to a video signal which fits to any TV standard. After it is modulated with a carrier, this signal can be sent to any TV set and antenna plug. Author (ESA)

N81-33811# Akron Univ., Ohio.

THE UNIVERSITY OF AKRON URBAN AIR POLLUTION AND HUMAN HEALTH STUDY

Richard A. Mostardi, Daniel L. Ely, Nancy Woebkenberg, Mary Conlon, Marcia Jarrett, and Glenn Atwood Jun. 1981 165 p refs

(Grant EPA-R-804526)

(PB81-213282; EPA-600/1-81-050) Avail: NTIS HC A08/MF A01 CSCL 06T

The chronic effects of our pollution volunteers from East Cleveland, Ohio and counterparts from Elyria, Ohio was studied. The East Cleveland area was chosen for its proximity to heavy industrial air pollution, and Elyria, because it is an urban area with an excellent record for air quality. Air quality was monitored by two aerometric stations in each city. It is indicated that there are some significant differences in the young age groups for lung function tests and questionnaire responses in favor of Elyria residents. Differences in the older age groups, favor the Cleveland residents. It is suggested that there is some selective migration associated with the Cleveland study area and that there may be an air pollution effect on the younger volunteers. GRA

N81-33812# California Univ., Santa Barbara. Inst. of Environmental Stress.

EFFECTS OF SULFURIC ACID MIST EXPOSURE ON PULMONARY FUNCTION Final Report, 1 Apr. 1977 - 31 Aug. 1980

Steven M. Horvath, Lawrence J. Folinsbee, and John F. Bedi Jun. 1981 92 p refs

(Grant EPA-R-804853)

(PB81-208977; EPA-600/1-81-044) Avail: NTIS HC A05/MF A01 CSCL 06F

Effects of 2 hr exposure to sulfuric acid (H2SO4) on pulmonary functions in male nonsmokers were examined. Mass media diameter was 0.92 micrometer, a sequence of 20 min exercise and 20 min rest was repeated three times during each exposure. Pulmonary functions were measured preexposure and postexposure. No significant changes in pulmonary functions were observed for HESO4 exposure. An increased prevalence of symptoms, was observed for H2SO4 exposure, suggesting that H2SO4 may have caused some pulmonary irritation though not sufficient to induce functional changes. It is concluded that 2 hr exposure, with intermittant exercise, to H2SO4 in the one micrometer size range and in concentrations up to 1100 micrograms/cu m was relatively minor effects on the pulmonary system. GRA

N81-33813# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.

PROCEDURES FOR EVALUATING NONPERTURBING TEMPERATURE PROBES IN MICROWAVE FIELDS Final Report

Christian U. Hochuli May 1981 44 p refs Sponsored in part by World Health Organization

(PB81-205882; FDA/BRH-81/67; DHHS/PUB/FDA-81/8143) Avail: NTIS HC A03/MF A01 CSCL 06B

Test procedures performed on nonperturbing thermometer probes specifically intended for use in microwave fields are described. The procedures included tests for: accuracy of temperature measurement, temperature stability over time, and radiofrequency interference in the instrumentation. It is indicated that the newly designed probes are less perturbing in phantoms of simulated muscle tissue irradiated by microwave diathermy applicators and, therefore, are candidates for use in monitoring temperature during hyperthermia treatments. GRA

N81-33814 British Library Lending Div., Boston Spa (England).

LITERATURE SOURCES IN TOXICOLOGY: A SURVEY

J. M. Hargreaves Jun. 1980 75 p refs

(BLL-BLRDR-5542; ISBN-0-905984-59-5; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The survey is divided into the following sections; data bases, data banks, manual sources, institutions and research centers, and toxicology information programs of national and international organizations. Entries in each section are arranged alphabetically. Each entry includes information on coverage, file size, and indexing and searching characteristics. On some cases, selected references are provided to explain further the construction or use of the data files. T.M.

N81-33772# Joint Publications Research Service, Arlington, Va.

LINEAR DISCRIMINANT FUNCTION USED TO ASSESS COSMONAUT REACTION TO LBNP

A. D. Voskresenskiy, V. A. Degtyarev, V. G. Doroshev, N. I. Vikhrov, Zh. V. Barsukova, and N. A. Lapshina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 1-4 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 4-6 (For primary document see N81-33771 24-51)

Avail: Issuing Activity

N81-33773# Joint Publications Research Service, Arlington, Va.

COMPARISON OF DIRECT AND INDIRECT METHODS OF MEASURING CARDIAC OUTPUT

V. G. Doroshev, N. N. Popov, V. P. Katuntsev, N. A. Lapshina, O. B. Kulikov, G. K. Chizhov, V. A. Galichiy, K. S. Yurova, and R. I. Finogenova *In its* USSR Rept.: Space Biol. and Aerospace

Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 5-8 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 7-9 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33774# Joint Publications Research Service, Arlington, Va.
EFFECT OF NEGATIVE PRESSURE AND OCCLUSION CUFFS ON INTRAVASCULAR PRESSURE IN LEGS OF HEALTHY MAN
V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, and V. V. Rumyantsev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 9-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 9-12 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33775# Joint Publications Research Service, Arlington, Va.
EFFECT OF LOWER BODY NEGATIVE PRESSURE (CHIBIS GARMENT) AND LOCAL NEGATIVE PRESSURE ON CENTRAL CIRCULATION IN HEALTHY MAN
V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, V. V. Rumyantsev, and Ye. V. Kolpakov *In* Its USSR Rept.: Space Biol. and Aerospace Med. Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) p 14-21 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 13-18 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33777# Joint Publications Research Service, Arlington, Va.
ECHOVENTRICULOMETRY USED TO STUDY SPINAL FLUID CIRCULATION DURING REDISTRIBUTION OF FLUIDS IN A CRANIAL DIRECTION
V. I. Sokolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 27-29 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 22-23 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33778# Joint Publications Research Service, Arlington, Va.
EFFECT OF ONE DAY IMMERSION ON CARDIORESPIRATORY PARAMETERS OF MAN DURING EXERCISE
S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 30-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 24-26 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33779# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOKINESIA IN HEAD DOWN POSITION ON MAN'S EQUILIBRIUM FUNCTION
A. R. Kotovskaya, L. N. Gavrilova, and R. R. Galle *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 34-38 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 26-29 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33780# Joint Publications Research Service, Arlington, Va.
PROGNOSTIC VALUE OF BLOOD CHOLESTEROL LEVEL IN HEALTHY SUBJECTS
V. V. Vlasov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 39-43 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 30-33 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33781# Joint Publications Research Service, Arlington, Va.
EFFECT OF EXERCISE ON REACTIONS TO BREATHING A GAS MIXTURE WITH 5% CARBON DIOXIDE AND 14% OXYGEN
N. P. Krasnikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 44-47 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 33-35 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33783# Joint Publications Research Service, Arlington, Va.
STUDY OF DIGESTIVE TRACT MICROFLORA OF SOYUZ-13 AND SALYUT-4 CREWS
A. A. Lentsner, Kh. P. Lentsner, M. E. Mikelsaar, V. M. Shilov, N. N. Lizko, G. D. Syrykh, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 48-52 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 39-43 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33784# Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF DECOMPOSITION OF PLANT WASTE BY MICROORGANISMS UNDER AEROBIC CONDITIONS
I. L. Chernovich, L. M. Sidorova, and N. A. Maltseva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 53-59 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 44-45 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33794# Joint Publications Research Service, Arlington, Va.
COMPUTER USE FOR AUTOMATIC MEASUREMENT OF SOME PHYSIOLOGICAL PARAMETERS
V. A. Degtyarev, N. M. Zhurba, Yu. A. Kukushkin, V. G. Doroshev, and N. A. Lapshina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 101-106 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 70-73 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33795# Joint Publications Research Service, Arlington, Va.
METHOD FOR EVALUATING RESPIRATORY SYSTEM REACTION TO INCREASING HYPERCAPNIA
L. A. Ivanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 107-111 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, July. - Aug. 1981 p 74-76 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33801# Joint Publications Research Service, Arlington, Va.
METHOD FOR EVALUATING RESPIRATORY SYSTEM REACTION TO INCREASING HYPERCAPNIA
L. A. Ivanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 107-111 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, July. - Aug. 1981 p 74-76 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N81-33815# Canyon Research Group, Inc., Westlake Village, Calif.

APPLICATIONS OF ADVANCED EXPERIMENTAL METHODS TO VISUAL TECHNOLOGY RESEARCH SIMULATOR STUDIES: SUPPLEMENTAL TECHNIQUES Final Report, 26 May 1978 - 31 Mar. 1980

Charles W. Simon Orlando, Fla. Naval Training Equipment Center Jan. 1981 125 p refs
(Contracts N61339-78-C-0060; N61339-78-C-0096; NAVTRAEQUIPC Proj. 4781-6P5)
(AD-A095633; CWS-01-80; NAVTRAEQUIPC-78-C-0060-3) Avail: NTIS HC A06/MF A01 CSCL 05/9

This report is made up of a series of individual papers on techniques to enhance the behavioral research methods being used in the VTRS, or Visual Technology Research Simulator (formerly referred to as AWAVS, or Aviation Wide-Angle Visual System). These methods are applicable to many other topical areas in addition to flight simulation. The techniques discussed, which relate to problems of design, analysis and interpretation, are important addenda to material discussed elsewhere by the author. The following techniques are discussed. What to do when the model for the experimental design inadequately represents the empirical data; Using Yates: algorithm with screening designs; Analyzing residuals; Identifying the experimental conditions in 2 (to the k minus p power) designs when given the defining generators; An economical design for screening interaction effects; Graphic method and internal comparison for multiple response data; The place for replication in economical multifactor research; The significance of tests of statistical significance; Determining the probability of accepting the null hypothesis when in fact it is false; Testing non-additivity in experimental data from a Latin square design; How to include factors with more than two levels in a screening design; Analyzing extra-period change-over designs; Analyzing serially-balanced sequence designs; and Design economy when experimental factors selectively affect bi-variate criteria. GRA

N81-33816# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

EFFECT OF DIFFERENT RUNWAY SIZE ON PILOT PERFORMANCE DURING SIMULATED NIGHT LANDING APPROACHES

Henry W. Mertens and Mark F. Lewis Feb. 1981 21 p refs
(AD-A103190; FAA-AM-81-6) Avail: NTIS HC A02/MF A01 CSCL 06/16

In Experiment 1, three pilots flew simulated approaches and landings in a fixed-base simulator with a computer-generated-image visual display. Practice approaches were flown with an 8,000-ft-long runway that was either 75, 150, or 300 ft wide; test approaches were to runways with widths of 75, 100, 150, 200, and 300 ft. In Experiment 2, 40 pilots controlled the slant of a moving model runway during simulated night visual approaches. Five different models simulated runways from 100 to 300 ft wide and 3,000 to 9,000 ft long. As predicted, training on a wide runway in Experiment 1 lowered approach angle in approaches to narrower runways; a narrow practice runway also raised approach angles to wider runways. The magnitude of these practice effects increased as distance from runway threshold decreased. There was also a general tendency for approach angles to decrease as runway width decreased. The latter effect was corroborated in Experiment 2; in addition, generated approach angles decreased with increasing runway length. Giving half the pilots information about runway size prior to each approach had no effect on responses. These findings add to the quantitative evidence of danger in night visual approaches due to visual illusions and large variability in the visual perception of approach angle. GRA

N81-33817# RAND Corp., Santa Monica, Calif.

SELECTED RESEARCH PUBLICATIONS IN COGNITIVE SCIENCE BY RAND STAFF: 1979-1980

Sarah Goldin, Barbara Hayes-Roth, Frederick Hayes-Roth, Philip Klahr, Dave McArthur, Kathleen Stasz, Perry Thorndyke, Clairice Veit, Don Waterman, Keith Wescourt et al Feb. 1981 30 p refs
(AD-A103311; RAND/P-5950/12) Avail: NTIS HC A03/MF A01 CSCL 05/1

The bibliography presented on the following pages is a compilation of recent publications by some of the Rand researchers in the Information Processing System research program. The bibliography is selective, comprising only those papers concerned with the broad range of topics in Cognitive Science. These topics include the modeling of complex human behaviors, the construction of intelligent computer systems, and the representation of knowledge in human and computer memories. The research draws upon the disciplines of cognitive psychology, educational psychology, computer science, artificial intelligence, and linguistics. GRA

N81-33818# Technology Service Corp., Santa Monica, Calif.

ADVANCED COMPUTER IMAGE GENERATION TECHNIQUES EXPLOITING PERCEPTUAL CHARACTERISTICS Final Report

Anthony J. Stenger, Timothy A. Zimmerlin, James P. Thomas, and Myron Braunstein Aug. 1981 330 p refs
(Contract F33615-78-C-0020; AF Proj. 6114)
(AD-A103365; AFHRL-TR-80-61) Avail: NTIS HC A15/MF A01 CSCL 09/2

The study objectives involve applying psychological knowledge of visual perception to improve real-time computer image generation (CIG) simulators. The primary objective is to suggest and identify CIG algorithms for visual simulation that improve the training effectiveness of CIG simulators. The secondary objective is to identify areas of basic research in visual perception that have a significant impact on improving CIG technology. The project proceeded in a sequence of three phases. The first phase entailed observing existing CIG simulators. During the second phase existing perceptual knowledge was studied in light of the capabilities and limitations of existing CIG simulators. In the third phase improved CIG algorithms were developed and relevant areas for further perceptual research were identified. Author (GRA)

N81-33819# Wisconsin Univ. - Madison. Graduate School of Business.

ORGANIZATIONAL BEHAVIOR

Larry L. Cummings and R. B. Dunham 3 Aug. 1981 91 p refs
(Contract N00014-79-C-0750; NR Proj. 170-892)
(AD-A103625; TR-1-1-8) Avail: NTIS HC A05/MF A01 CSCL 05/1

This paper reviews the literature on organizational behavior from 1977 through the first quarter of 1981 and attempts to be projective and prescriptive as well as descriptive of the work covered. Selected topics reviewed include new overviews and integrations of the field, task design, feedback, organizational structure, technology, and control, new conceptualizations and emerging topical trends. These topics were chosen to reflect both current and controversial issues to recent research. Additionally, this review attempts to bring the macro or organizational side of organizational behavior into focus and analysis and conclusions are drawn concerning theoretical and research needs. Finally, it projects the likely developments within organizational behavior. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N81-33820# School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

FIELD STUDY DETERMINATION OF VENTILATORY REQUIREMENTS OF MEN RAPIDLY EVACUATING A SPACE LAUNCH COMPLEX Final Report, Jan. - Feb. 1980

Loren G. Myhre Nov. 1980 24 p
(AF Proj. 7930)
(AD-A095532; SAM-TR-80-43) Avail: NTIS HC A02/MF A01 CSCL 06/19

Physiological variables, including heart rate and minute ventilation, were monitored for 3 men and 1 woman during field trails simulating the emergency evacuation of Space Launch

Complexes (SLC) 4E and 4W at Vandenberg AFB in January 1980. It was concluded that a reasonably fit adult male rapidly evacuating the SLC works at a load approximating 65% of his aerobic capacity. Associated with this level of work is a ventilatory requirement of about 51 liters/min with corresponding peak inspiratory flow rates predicted to average about 180 liters/min. Under these conditions excessive rebreathing of expired air with the concomitant onset of hypoxia was clearly evident when wearing the Robertshaw Air Capsule is deemed to be unsuitable as a respiratory protection device during rapid evacuation of the SLG; its limited air supply (about 5 min) renders it a marginal device for a walking evacuation which requires about 4 min, 19 sec. The degree of protection from airborne contaminants provided by the Robertshaw Air Capsule under work stress conditions simulating both (a) rapid and (b) walking evacuation awaits laboratory testing. GRA

N81-33821# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

THE DEVELOPMENT AND AIRBORNE TESTING OF THE PALE SEAT Final Report

Harald J. vonBeckh 20 Jun. 1981 102 p refs
(ZF61412001)
(AD-A103663; NADC-81200-60) Avail: NTIS HC A06/MF A01 CSCL 05/8

The development, centrifuge testing and airborne evaluation of the G-protective PALE (Pelvis and Legs Elevating) seat are described. This articulated seat achieves supination by elevating the pelvis and legs forward and upwards, while the head and shoulders barely move. Thus, out-of-the-cockpit vision and vision of displays are unchanged; labyrinthine symptoms are avoided, and head-up displays (HUD) can be easily used because the distance between windshield and eyes does not change. A historical review will list and describe all known seat configurations for prone and supine positioning that reached the stage of the airborne testing. The urgency to provide fighter aircraft with transverse positioned seats is emphasized. It is concluded that squadron of aircraft equipped with these seats will have an advantage in air combat situations. Author (GRA)

N81-33822# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

DEVELOPMENT OF IMPROVED SH-3 HELICOPTER SEAT CUSHIONS Final Report

Dan Lorch 17 Jul. 1981 25 p refs
(AD-A103484; NADC-81188-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

The proposed replacement seat cushions are made of closed cell foam and are painted with a flexible coating. Both the seat cushion and back cushion have ridges cut in the foam, and are covered with an open weave space fabric to improve air circulation. Test indicate that these cushions provide considerable improvement in comfort, reduction of maintenance and cost.
Author (GRA)

N81-33823# Michigan Univ., Ann Arbor. Human Performance Center.

THE DEVELOPMENT AND UTILIZATION OF INTEGRATED MULTIDIMENSIONAL DISPLAYS Final Report, 1 Jun. 1976 - 30 Nov. 1980

Robert G. Pachella Feb. 1981 19 p refs
(Contract N00014-76-C-0648; NR Proj. 197-035)
(AD-A103170; HPC-67) Avail: NTIS HC A02/MF A01 CSCL 05/8

The purpose of this contract was to establish a program of research that would lead to basic facts about the nature of complex integrated multidimensional displays and their compatibilities with human perceptual abilities. Further, it was our goal to develop a comprehensive theory of multidimensional integrality as well as methodological techniques to investigate these questions. During the four and a half years of the contract's duration nine technical reports were issued and two more reports are in preparation. These detail the various empirical and theoretical pursuits of the principal investigator and his colleagues. A bibliography of these technical reports is appended. In addition to these written reports, contract work was reported orally at 16 scientific meetings and conferences. The research supported by the contract is presented under four major headings: (a) preliminary analyses of dimensional integrality, (b) necessary methodological developments for the study of integrality, (c) empirical findings and theoretical development, and (d) work in preparation. GRA

N81-33824# Anthropology Research Project, Yellow Springs, Ohio.

AN ANTHROPOMETRIC DATA BASE FOR COMMERCIAL DESIGN APPLICATIONS, PHASE 1 Final Report, 1 Sep. 1980 - 28 Feb. 1981

John T. McConville, Kathleen M. Robinette, and Thomas Churchill 24 Feb. 1981 46 p refs
(Grant NSF DAR-80-09861)
(PB81-211070; NSF/BNS-81001) Avail: NTIS HC A03/MF A01 CSCL 05E

The feasibility of using for civilian designs the comprehensive body size data presently available to the armed forces was studied. The creation of an anthropometric data base for civilian uses from assembled data that were analyzed and applied to the design of military clothing, equipment, and workspaces is proposed. Statistical matching procedures and regression estimates were used to demonstrate that body sizes of U.S. males of working age, is characterized by information extrapolated from selected military samples. A large number of U.S. women is represented by military body size data, although military data were not available for women over 220 pounds. It is concluded that most commercial and industrial design needs for body size data can be met from the military data. GRA

N81-33825# Dynamic Science, Phoenix, Ariz.

ANTHROPOMORPHIC DUMMY POSITIONING AND REPEATABILITY MEASUREMENTS Final Report, Oct. 1980 - Jan. 1981

Jan. 1981 60 p
(Contract DT-NH22-80-C-0263)
(PB81-212367; Rept-3112-81-004; DOT-HS-805882) Avail: NTIS HC A04/MF A01 CSCL 13F

The purpose of the tests conducted was two fold: to determine if the proposed compliance procedure would provide repeatable results; and to see if the requirements can be met without violating the anchorage location requirements specified in FMVSS 210. Repeatability in the positioning of the upper torso of the dummy was poorer for the van and pick-up than for passenger cars. Position of the belt in the belt fit zone is not highly sensitive to variations in dummy position. For standard belt systems tested, modifications made to the seat belt assemblies would still meet the requirements of FMVSS 210. GRA

N81-33776# Joint Publications Research Service, Arlington, Va.

USE OF NUTRIENTS TO CORRECT THE ADRENOCORTICAL SYSTEM

S. Kalandarov, V. P. Bychkov, I. D. Frenkel, and T. P. Petukhova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 22-26 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 19-22 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-33796# Joint Publications Research Service, Arlington, Va.

LOG-LINEAR REGRESSION METHOD USED TO ASSESS QUALITY OF AIR SAMPLES IN FLUOROPLASTIC CONTAINERS

V. Ye. Ryzhkova, Ye. N. Kulkov, and K. N. Mikos *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 15, No. 4, Jul. - Aug. 1981 (JPRS-79085) 28 Sep. 1981 p 112-115 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 15, no. 4, Jul. - Aug. 1981 p 76-78 (For primary document see N81-33771 24-51)
Avail: Issuing Activity

N81-34136# Southampton Univ. (England). Inst. of Sound and Vibration Research.

BIODYNAMIC RESPONSE TO WHOLE-BODY VIBRATION

M. J. Griffin *In* The Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. 8 Aug.

1981 p 3-12 refs (For primary document see N81-34135 24-99)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 05/8

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N81-33826# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
SYNTHESIS OF INVARIANT ASSERTIONS FOR ARITHMETICAL PROGRAMS
S. Kamal Abdali and Jan Vytopil Jun. 1981 32 p refs
(Contract N00014-75-C-1026)
(AD-A103748; RPI-CS-8101) Avail: NTIS HC A03/MF A01 CSCL 12/1

A program is called arithmetical if it is obtained from a flowchart schema under an interpretation in which the domain consists of non-negative integers and the assigned functions and predicates are arithmetical in the sense of Goedel. The computation done by arithmetical programs is characterized in terms of arithmetical predicates. This is a first-order formalization, compared to the second-order, Cooper-Manna formalization. It is shown that for the class of arithmetical programs, the problem of synthesis of invariant assertions is solvable, and a simple algorithm is given to construct arithmetic predicates which can serve as invariant assertions. Two alternative definitions of invariant assertions found in the literature -- minimal predicates and optimal predicates -- are shown to be equivalent. It is proved that the arithmetical predicates generated by our algorithm satisfy the definition of both minimal and optimal predicates.
Author (GRA)

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N81-33827*# Southern Univ., Baton Rouge, La. Dept. of Electrical Engineering.
DEVELOPMENT OF A FAULT-TOLERANT MICROPROCESSOR BASED COMPUTER SYSTEM FOR SPACE FLIGHT Final Report
V. T. Montgomery [1981] 49 p refs
(Grant NsG-8053)
(NASA-CR-161873) Avail: NTIS HC A03/MF A01 CSCL 09B

A methodology for the design of a tightly coupled, highly reliable microprocessor based computer system is described. The concept of triple modular redundancy with sparing is used. The notion of synchronizing by using a single crystal oscillator is examined. The use of decoders to replace voters is also used. The decoders not only isolate the failed module but also allow error identification to be accomplished. Each module is to have its own RAM memory. The necessary circuitry to select a correct memory and the corresponding DMA controller was designed.
M.G.

N81-33828# Research Triangle Inst., Research Triangle Park, N. C.
A PRELIMINARY TESTABILITY ANALYSIS OF THE MIL-STD-1862 ARCHITECTURE Final Report, 22 May 1979 - 31 Dec. 1980
F. M. Smith and J. A. Bannister Fort Monmouth, N.J. Army Communications-Electronics Command Aug. 1981 86 p refs
(Contract DAAK80-79-C-0780)
(AD-A103438; RTI/1822/04-02F; CECOM-80-0780-F) Avail: NTIS HC A05/MF A01 CSCL 09/2

This study has addressed the ramifications of built-in-test (BIT) as an integral part of the military computer family (MCF) architecture. This was done by looking at concurrent and nonconcurrent BIT and how it would fit into the current MCF architecture specifications. The current reporting mechanisms in the MCF architecture were evaluated to see which would best serve as a reporting mechanism for concurrent BIT signals. As an upshot of error detection, an error recovery strategy is proposed. As a consequence of this comprehensive recovery strategy, a set of instructions are proposed that would aid in error recovery. Test and recovery in software is the main thrust of the nonconcurrent BIT section of this study. An error data base is proposed. This data base could be accessed as a history by maintenance personnel to provide information to an intelligent error handler and to provide information for reconfiguration control. Several instructions are proposed for doing fault diagnosis and isolation. Rollback and recovery is discussed along with the concept of a recovery cache.
GRA

N81-33829# Pennsylvania Univ., Philadelphia. Dept. of Decision Sciences.
MDM: HANDLING THE TIME DIMENSION IN GENERALIZED DBMS Final Report
Gad Ariav and Howard L. Morgan 6 May 1981 36 p refs
(Contracts MDA903-80-C-0093; N00014-75-C-0462)
(AD-A103308; Rept-81-05-06) Avail: NTIS HC A03/MF A01 CSCL 09/2

The sense of time is implicit in almost all human activity, yet it is rarely reflected in the computer database views of these activities. This paper offers a method of dealing with time, modal storage and retrieval, and describes formal and practical realizations of the concept. The conceptual framework of Modal Data Management reflects three years of experience with the DATA (Dynamic Alerting Transaction Analysis) system, in which a time oriented DBMS has been conceived, designed and actually implemented. The paper first anchors the Modal Data Management concept in the context of the relevant research in Information Modelling and storage technologies, followed by a discussion of the architectural and functional attributes of the DATA system. The major lessons from the DATA experience are then presented, paying special emphasis to their impact on the design of future versions of the system. The concluding comments deal with specific implications of the Modal Data Management in the domains of DBMS usability and Software Engineering.
Author (GRA)

N81-33830# General Electric Co., Pittsfield, Mass.
ELECTRICAL CHARACTERIZATION OF ADVANCED MICROPROCESSORS Final Technical Report, Jan. - Dec. 1980
Griffiss AFB, N.Y. RADC Jun. 1981 133 p
(Contract F30602-80-C-0041; AF Proj. 2338)
(AD-A104170; RADC-TR-81-126) Avail: NTIS HC A07/MF A01 CSCL 09/2

The objective of this effort was to develop functional and parametric tests for selected microprocessors and to develop MIL-M-38510 slash sheets for them. A test pattern and program were developed for the Z8001 and data was taken and analyzed to determine its operating region. A general benchmark was also developed and used to compare the performance of the 8086 and Z8000.
Author (GRA)

N81-33831# Ohio State Univ., Columbus. Computer and Information Science Research Center.
DESIGN AND ANALYSIS OF A MULTI-BACKEND DATA-

BASE SYSTEM FOR PERFORMANCE IMPROVEMENT, FUNCTIONALITY EXPANSION AND CAPACITY GROWTH, PART 1
David K. Hsiao and M. Jaishankar Menon Jul. 1981 187 p
(Contract N00014-75-C-0573)
(AD-A103776; OSU-CISRC-TR-81-7) Avail: NTIS HC A09/MF A01 CSCL 09/2

This report presents a new approach to the solution of database management problems involving database growth and performance enhancement. A system which uses a multiplicity of conventional minicomputers, novel hardware configuration and innovative software design is presented. This extensible system tries to achieve the ideal goal of having the performance (both response time and throughput) be proportional to the multiplicity of minicomputers. The first effort is to identify the problems and bottlenecks involved in developing such an ideal system. Two major problems, one called the controller limitation problem and the other the channel limitation problem are identified. Having identified these problems, the next effort is to systematically eliminate or minimize the ill-effects of these problems. Also identified are a number of other problems. For studying the multiple back-end database system, we utilize queueing models and simulation. Queueing models and simulation are used at different design stages in order to aid the design process. Finally, ours is the only comprehensive design of a multiple backend system that covers all aspects of database management. Algorithms for the four basic request types (insert, retrieve, delete and update) algorithms for aggregate operations, algorithms for access control, algorithms for concurrency control, algorithms for database reorganization and algorithms for addition of new backends are all analyzed and specified. GRA

N81-33832# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DATA-FLOW COMPUTER ARCHITECTURE Annual Technical Progress Report, 1 Jul. 1980 - 30 Jun. 1981
Jack B. Dennis 1981 7 p refs
(Contract DE-AC02-79ER-10473)
(DE81-028310; DOE/ER-10473/2) Avail: NTIS HC A02/MF A01

A data flow source language, construction of an engineering model, program translation, data structure, architecture description and simulation, and specification of a full-scale data flow processor are briefly discussed. DOE

N81-33833# Siemens A.G., Munich (West Germany). Geschaeftsbereich Intergrierte Schaltungen.
DEVELOPMENT OF INTEGRATED ANALOGUE-TO-DIGITAL CONVERTERS Final Report
Heinrich Kessler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-169; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

An integrating 3 1/2-decade converter in mono-slope technique for display of measurements and an 8 bit converter in successive approximation technique as an analog input for microcomputers were developed. The 3 1/2-decade converter work resulted in the manufacturing of first samples. Because of market reasons, the circuit will not be delivered to customers individually, but rather become an integral part of more highly integrated circuits, such as microcomputers. The development of the 8 bit converter resulted in the introduction of the product on the market. Development details and chip characteristics are outlined. Author (ESA)

N81-33834# Federal Compiler Testing Center, Falls Church, Va. Automated Data and Telecommunications Service.
CONTROL DATA CORPORATION COBOL 5.3 LEVEL 540 CYBER 73, NOS 1.3 LEVEL 528 Validation Summary Report
2 Jun. 1981 66 p refs
(PB81-213829; CCVS74-VSR765) Avail: NTIS HC A03/MF A01 CSCL 09B

The validation summary report (VSR) for the CDC NOS Cobol compiler 5.3 Level 540 (NOS 1.3 level 528) is presented. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N81-33334# Stuttgart Univ. (West Germany).
COMPUTER-AIDED REGISTRATION AND PROCESSING OF MEASUREMENT DATA OF TESTS ON TURBOMACHINES [RECHNERUNTERSTUETZTE MESSDATENERFASSUNG UND VERARBEITUNG BEI VERSUCHEN AN TURBOMASCHINEN]
H. P. Diettrich, D. Haller, and M. Voelmle *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 263-282 refs In GERMAN Sponsored in part by Deutsch Forschungsmeinschaft (For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

N81-33537# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
NEW WAYS OF COMMUNICATION IN GEOSCIENCES BY MEANS OF AUTOMATIC DATA PROCESSING [NEUE KOMMUNIKATIONSWEGE IN DEN GEOWISSENSCHAFTEN MIT HILFE DER AUTOMATISCHEN DATENVERARBEITUNG]
Renier Vinken *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 110-124 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N81-33835*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS, CONFERENCE ON THE COMPUTING ENVIRONMENT FOR MATHEMATICAL SOFTWARE
15 Jul. 1981 37 p refs Conf. held at Pasadena, Calif., 29-31 Jul. 1981
(Contract NAS7-100)
(NASA-CR-164849; JPL-Pub-81-67) Avail: NTIS HC A03/MF A01 CSCL 09B

Recent advances in software and hardware technology which make it economical to create computing environments appropriate for specialized applications are addressed. Topics included software tools, FORTRAN standards activity, and features of languages, operating systems, and hardware that are important for the development, testing, and maintenance of mathematical software. J.M.S.

N81-33836*# Atsuko Computing International, Huntsville, Ala.
MODIFY THE JACCHIA MODEL Final Report
John S. Hickey 25 Sep. 1981 150 p refs
(Contract NAS8-34004)
(NASA-CR-161876; ACI-092581-FR) Avail: NTIS HC A07/MF A01 CSCL 09B

Existing Jacchia were converted from the UNIVAC 1108 to the SSL REEDA computer system and the overall program capabilities were enhanced. The Jacchia Models and the associated data bases reside on a REEDA System dedicated 'JACCHIA' disc pack. The Jacchia programs, their operation, and the outputs generated outputs are described. A.R.H.

N81-33837*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF A LOCAL LINEARIZATION TECHNIQUE FOR THE SOLUTION OF A SYSTEM OF STIFF DIFFERENTIAL EQUATIONS ASSOCIATED WITH THE SIMULATION OF A MAGNETIC BEARING ASSEMBLY
Kemper S. Kibler and Gary A. McDaniel (Sperry Systems Management) Sep. 1981 37 p refs

(NASA-TM-83146) Avail: NTIS HC A03/MF A01 CSCL 09B

A digital local linearization technique was used to solve a system of stiff differential equations which simulate a magnetic bearing assembly. The results prove the technique to be accurate, stable, and efficient when compared to a general purpose variable order Adams method with a stiff option. M.G.

N81-33838*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAM FOR PULSED THERMOCOUPLES WITH CORRECTIONS FOR RADIATION EFFECTS

Herbert A. Will Sep. 1981 42 p refs

(NASA-TP-1895; E-615) Avail: NTIS HC A03/MF A01 CSCL 09B

A pulsed thermocouple was used for measuring gas temperatures above the melting point of common thermocouples. This was done by allowing the thermocouple to heat until it approaches its melting point and then turning on the protective cooling gas. This method required a computer to extrapolate the thermocouple data to the higher gas temperatures. A method that includes the effect of radiation in the extrapolation is described. Computations of gas temperature are provided, along with the estimate of the final thermocouple wire temperature. Results from tests on high temperature combustor research rigs are presented. R.C.T.

N81-33839# Naval Training Analysis and Evaluation Group, Orlando, Fla.

TEXT AND ILLUSTRATION PROCESSING SYSTEM (TIPS) USER'S MANUAL. VOLUME 1: TEXT PROCESSING SYSTEM

Cheryl J. Brown and Ray Cox Jul. 1981 175 p refs

(AD-A103678; TAEG-106-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 09/2

This manual describes a text processing system developed by the Training Analysis and Evaluation Group. This volume contains the procedures to teach the relatively inexperienced user of the system how to enter and edit textual material in step sequence. Also provided is information on storage and system maintenance for the system manager. Volume 2, which will be published at a later date, will describe the graphics processing system. Author (GRA)

N81-33840# National Physical Lab., Teddington (England).

TUTORIAL MATERIAL ON THE REAL DATA TYPES IN ADA Final Technical Report

Brian A. Wichman Nov. 1980 94 p refs

(Contract DAJA37-80-M-0342)

(AD-A103482) Avail: NTIS HC A05/MF A01 CSCL 09/2

The Ada programming language introduces a number of novel features in the area of numerics. The purpose of this report is to present these features to the programmer who is familiar with numerical computation but not with Ada. The report is designed to be presented as a lecture with the aid of viewgraphs (drafts of these are included). However, the material can be read in conventional fashion. Author (GRA)

N81-33841# North Carolina State Univ., Raleigh. Operations Research.

PROCEDURES FOR HEURISTIC SCHEDULING UNDER LIMITED RESOURCES IN ACTIVITY NETWORKS

S. E. Elmaghraby and Z. M. Naman Jun. 1981 29 p refs

(Contract DAAG29-79-C-0211; Grant NSF ENG-78-17936)

(AD-A103638; NCSU-OR-178; ARO-16352.9-M) Avail: NTIS HC A03/MF A01 CSCL 12/2

This is the documentation of a program that permits the analyst to choose any one of three priority rules of schedule activities under conditions of limited resources. The program is written in FORTRAN. We give the logic of the programs, a flowchart representation, and a printout of the instructions (upon request). Also, a solved sample problem is included. This program is available at a nominal fee from the Graduate Program in Operations Research, NC State University, PO Box 5511, Raleigh, NC 27650. Author (GRA)

N81-33842# Tennessee Univ. Space Inst., Tullahoma. Gas Diagnostics Research Div.

RESEARCH ON IMAGE ENHANCEMENT ALGORITHMS Final Technical Report, 9 Jun. 1980 - 31 May 1981

Lewis J. Pinson and Jeffrey P. Kankford Redstone Arsenal, Ala. Army Missile Company 31 May 1981 113 p refs

(Contract DAAH01-80-C-1143)

(AD-A103216; DRSMI/RG-CR-81-3) Avail: NTIS HC A06/MF A01 CSCL 09/2

Six specific image enhancement algorithms are analyzed, simulated and evaluated for potential real-time application to imagery obtained from target acquisition systems. Three processing methods are recommended as operator controlled options for application to the imagery. They are median filtering, gradient processing and locally adaptive gain control. The objective for this effort was to identify and examine methods for enhanced acquisition and handoff for small targets in a complex and cluttered background. Author (GRA)

N81-33843# Colorado Univ. at Boulder. Dept. of Computer Science.

FSCAN-1981 REPORT AND USER'S MANUAL Interim Technical Report

Geoffrey M. Clemm Jun. 1981 46 p refs

(Grants DAAG29-78-G-0046; NSF MCS-77-02194)

(AD-A103635; CU-CS-202-81; ARO-15074.13-M) Avail: NTIS HC A03/MF A01 CSCL 09/2

FSCAN is a language for specifying the lexical analysis of programs written in any current programming language, including FORTRAN. This report describes the FSCAN language, a compiler for the language, and an interpreter for the resulting object code. The interpreted object code forms an efficient lexical analyzer that takes as input a stream of characters and produces as output a stream of tokens (lexical units). The compiler and interpreter are designed for portability. Both are written in ANSI FORTRAN (1966) supplemented by a small number of short machine dependent subroutines. Author (GRA)

N81-33844# Lincoln Lab., Mass. Inst. of Tech., Lexington.

LFP USER'S MANUAL (LINCOLN FORTRAN PREPROCESSOR) VERSION 02.01 FOR MODCOMP SYSTEMS

James H. Cosgrove, Edward T. Batliss, and James M. Sivak 12 May 1981 69 p refs

(Contract F19628-80-C-0002; ARPA Order 3391)

(AD-A103529; TR-150; ESD-TR-81-150) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Lincoln FORTRAN Preprocessor (LFP) was constructed to facilitate structured programming by extending FORTRAN to include the most useful top down control structures. The choice of FORTRAN for a target language was dictated by its being the only higher level language available on many mini-computers. This work was motivated by a desire to make top-down structured programming tools available for the development of FORTRAN software. LFP is an upward compatible extension of FORTRAN which provides five new top down decision structures, five additional loop structures and an internal procedure capability. In addition to structured control, LFP provides a neat, automatically-formatted, structured listing. The ease of program construction and clarity of program documentation are greatly enhanced thus reducing the clerical detail and the likelihood of programming in bugs. At Lincoln Laboratory, LFP is implemented on a MODCOMP 4 under MAX 4-rev D operating system and on an Amdahl 470 with the CP/CMS operating system. Author (GRA)

N81-33845# General Research Corp., Huntsville, Ala.

AN EVALUATION OF SOFTWARE COST ESTIMATING MODELS Final Technical Report, Sep. - Oct. 1979

Robert Thibodeau Griffiss AFB, N.Y. RADC Jun. 1981 262 p refs

(Contract F30602-79-C-0244; AF Proj. 5581)

(AD-A104226; GRC-CR-1-940) Avail: NTIS HC A12/MF A01 CSCL 09/2

Nine software cost estimating models are evaluated to determine if they satisfy Air force needs. The evaluation considers both the qualitative and quantitative aspects of the models' outputs. Air Force needs for cost estimates are established by the Major Weapon System Acquisition Process. Associated with the different development phases are five cost estimating situations. Decisions that are made early in the Acquisition Process require software cost information that includes the entire life

cycle for complete software systems, subsequent decisions require more detailed cost information. Comparison of the outputs of the nine test models with the requirements established by the five cost estimating situations indicates that the models are able to satisfy only the needs of the earliest phase of the Acquisition Process. The models perform satisfactorily for the purpose of allocating funds for software acquisition, but they fail to support such needs as assessment of alternative designs, proposal evaluation, or project management. GRA

N81-33846# Naval Postgraduate School, Monterey, Calif.
INITIALIZATION DESIGN FOR DYNAMIC DETERMINATION OF RESOURCES M.S. Thesis
Gary Stewart Baker Jun. 1981 110 p refs
(AD-A104130) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis presents a versatile initialization design for dynamic determination of physical resources in an adaptive manner for a multi-microprocessor environment. The design is general in nature and represents a structured, functional approach to the initialization process based on the use of dynamic resource mapping, knowledge passing between layered program components, and coordinated interprocessor communication. An implementation of this design is presented for initialization of the Secure Archival Storage System. The hardware architecture utilizes the commercially available, Z8000 based Advanced Micro Computer Am96/4116 MonoBoard Computer, configured to support information security. Author (GRA)

N81-33847# Naval Surface Weapons Center, Dahlgren, Va. Dept. of Strategic Systems.
SIMPL-Q REFERENCE MANUAL
Charles J. Naples May 1981 170 p refs
(AD-A104160; NSWC-TR-81-262) Avail: NTIS HC A08/MF A01 CSCL 09/2

The SIMPL-Q system consists of a system computer programming language (SIMPL-Q) and a simple macro language (SML). The SIMPL-Q compiler and SML execute on either the CDC-6700 under the SCOPE 3.4 operating system or on the Nanodata QM-1 under the EASY-II operating system. The code produced by the SIMPL-Q system is designed to execute on the Nanodata QM-1 EASY intermediate language machine. The SIMPL-Q language is a member of the SIMPL-T family of languages. SIMPL-T was designed and implemented on the UNIVAC 1108 by Victor R. Basili and Albert J. Turner. SIMPL-T is a transportable structured programming language with three basic data types: integer, character, and string. SIMPL-T was enhanced to allow it to be used as a system programming language for the Nanodata QM-1, hence the name SIMPL-Q. This report, which is intended to be used as a reference manual, presents the details, rules, and examples for writing programs in the SIMPL-Q language. It also contains sufficient information to prepare and compile such programs. GRA

N81-33848# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
THEOREM GENERALIZATION IN PROGRAM VERIFICATION
Jan Vytopil and S. Kamal Abdali Jun. 1981 34 p refs
(Contract N00014-75-C-1026)
(AD-A103749; RPI-CS-8102) Avail: NTIS HC A03/MF A01 CSCL 09/2

The generalization of theorems about programs obtained from recursive schemas is discussed. Methods are given to generalize theorems about two classes of programs to make the theorems easier to prove by induction. Invariant assertions are obtained as a by-product of the generalization process. Also, methods are given to redefine the functions representing programs so as to simplify the proof of programs properties in certain cases. Author (GRA)

N81-33849# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
AN ATTRIBUTED LL(1) COMPILATION OF PASCAL INTO THE LAMBDA-CALCULUS
Erich Kaltofen and S. Kamal Abdali Jun. 1981 53 p refs
(Contract N00014-75-C-1026)
(AD-A103750; RPI-CS-8103) Avail: NTIS HC A04/MF A01 CSCL 09/2

A Pascal compiler is described whose target language is the lambda-calculus instead of some machine code. Although the lambda-calculus code generated by this compiler can be executed by means of a lambda-expression reducer, the intended use of the translation is in proving programs correct. The compiler is written in Pascal itself, and contains an attributed LL(1) parser of the complete standard Pascal language. The error recovery is quite elaborate. The code generalization is done for a large subset of the language, covering: assignments, compound, conditional and repetitive statements, procedures including recursive calls and global side effects, multidimensional arrays. This report contains a formal definition of the target language, a lambda-calculus model for the selected subset of Pascal, and a code-independent description of compilation algorithms including the complete LL(1) push-down automation. GRA

N81-33850# Sandia Labs., Albuquerque, N. Mex. Applied Mathematics Div.
SOFTWARE FOR ORDINARY DIFFERENTIAL EQUATIONS
L. F. Shampine and Herman A. Watts Jul. 1981 41 p refs
(Contract DE-AC04-76DP-00789)
(DE81-027412; SAND-81-1421) Avail: NTIS HC A03/MF A01

Software issues associated with the numerical solution of ordinary differential equations (ODE) are discussed. Particular methods and codes implementing the various methods are mentioned to illustrate specific points, e.g., the DEPAC package of ODE codes. Emphasis is placed on the concerns and decisions which are important in the design and algorithmic development of user oriented ODE software. DOE

N81-33851# British Aerospace Aircraft Group, Warton (England). Dept. of Aerodynamics.
NOTES ON USE OF MODIFIED VERSION OF USSAERCO/C PROGRAM ETOE 01C
Doreen Marland, D. G. Gibson, and K. Bashall Mar. 1981 38 p refs
(BAe/A/671) Avail: NTIS HC A03/MF A01

Deficiencies in the original supersonic panelling program are described, and corrections and options are given. Panelling criteria specific to the program are presented. Details of changed facilities and the associated data modifications are provided. The program was linked to the Aeroelastic suite of programs, and the link and method of use are shown. A preprocessor is available to USSAERO/C to allow plotting of geometric data. Author (ESA)

N81-33331# Stuttgart Univ. (West Germany).
REALIZATION OF A COMPLEX TECHNOLOGICAL DATA-PROCESSING PROJECT WITH THE HELP OF SOFTWARE ENGINEERING [REALISIERUNG EINES KOMPLEXEN TECHNISCH-WISSENSCHAFTLICHEN EDV-PROJEKTES MIT HILFE DES 'SOFTWARE-ENGINEERING']
B. Schulz *In its* Commemoration of 60th Anniv. of Professor Dr. Jakob Wachter Jan. 1980 p 197-220 refs In GERMAN
(For primary document see N81-33321 24-31)
Avail: NTIS HC A16/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N81-33852# Singer Co., Wayne, N. J.
A USER ORIENTED MICROCOMPUTER AND MONITOR SYSTEM Final Report, Oct. 1977 - Jun. 1981
John W. Stark Wright-Patterson AFB, Ohio AFWAL 15 Feb. 1981 127 p refs
(Contract F33615-77-C-1176; AF Proj. 2003)
(AD-A103782; AFWAL-TR-81-1130) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report documents the design definition, implementation, and test of a User Oriented MIL-STD-1750 Microcomputer and Monitor System. The system design incorporates several experimental features to enhance program development and measurement in an avionics integration laboratory environment, the most noteworthy of which is a monitor real time memory map function. Author (GRA)

N81-33853# Naval Postgraduate School, Monterey, Calif.
ANALYTIC PERFORMANCE MODELING OF CONCURRENT COMPUTER SYSTEMS BY STOCHASTIC PETRI NETS Ph.D. Thesis
Scott William Smart Jun. 1981 100 p refs
(AD-A104054) Avail: NTIS HC A05/MF A01 CSCL 09/2

Petri nets are presented as a technique for representing computer systems having asynchronous, concurrent operations. The structure of the nets are analyzed as a means of demonstrating the correctness of the modeled system. The execution of the petri net is considered as a stochastic process, allowing analysis of the model as a queueing network system by transforming the petri net into its stochastic equivalent net. It is shown that product form solutions for the state probabilities exist for the class of state machine decomposable nets but not for the more general class of consistent petri nets. Solutions for the corresponding open systems are derived by extending the petri net model to include arbitrary sources and sinks.
Author (GRA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N81-33854# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
CONTROLLED INVARIANCE FOR AFFINE CONTROL SYSTEMS
H. Nijmeijer Dec. 1980 17 p refs Submitted for publication
(MC-BW-133/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3.45

A solution of the disturbance decoupling problem for nonlinear systems is given. Using differential geometry, a theory for nonlinear systems is developed analog to the geometric approach for linear systems as a successful way to solve various synthesis problems in control theory. Nonlinear A (mod B) invariance is emphasized. A coordinate free definition of a control system is presented. The concept of controlled invariant distributions is introduced and the main theorems are proven. A conceptual algorithm for computing a controlled invariant distribution is shown.
Author (ESA)

N81-33855# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
COMPUTATIONAL METHODS FOR SINGLE SERVER AND MULTI-SERVER QUEUES WITH MARKOVIAN INPUT AND GENERAL SERVICE TIMES
H. C. Tijms and M. H. vanHoorn (Vrije Univ.) Jan. 1981 28 p refs Submitted for publication
(MC-BW-135/81) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 3.15

Efficient and stable algorithms to compute the steady state probabilities and the moments of the waiting time are specified. The multi-server queue with Poisson input and general service times is discussed. For the steady state probabilities, good quality approximations to be computed from a stable recursive algorithm are presented. As a by-product, simple approximations for the delay probability and the moments of the waiting time are obtained. For the output process, tractable and good approximations for the moments of the interdeparture time are derived. Extensions to the finite capacity M/G/c queue and the machine repair problem with multiple repairmen having general times were also examined.
Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N81-33856*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL BOUNDARY CONDITION PROCEDURES
Oct. 1981 383 p refs Symp. held at Moffett Field, Calif., 19-20 Oct. 1981
(NASA-CP-2201; A-8736) Avail: NTIS HC A17/MF A01 CSCL 12A

Topics include numerical procedures for treating inflow and outflow boundaries, steady and unsteady discontinuous surfaces, far field boundaries, and multiblock grids. In addition, the effects of numerical boundary approximations on stability, accuracy, and convergence rate of the numerical solution are discussed. For individual titles, see N81-33857 through N81-33878.

N81-33857*# New York Univ., N. Y. Inst. of Mathematical Sciences.
FAR FIELD CONDITIONS FOR COMPRESSIBLE FLOWS
Alvin Bayliss and Eli Turkel (Tel-Aviv Univ.) *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 1-20 refs (For primary document see N81-33856 24-64)
(Contracts NAS1-14472; NAS1-16394; Grant AF-AFOSR-2881-76)
Avail: NTIS HC A17/MF A01 CSCL 12A

The numerical treatment of exterior regions requires a method to convert the problem to one in a bounded region. One method is to truncate the unbounded region at some finite, artificial surface. This creates a finite computational region at the expense of imposing boundary conditions at the artificial boundary. If the problem has wave-like solutions near infinity, then these boundary conditions must simulate the radiation of energy out of the computational domain and towards infinity. Incorrect specification of these radiation boundary conditions can cause spurious reflected waves to be generated at the artificial boundary. Radiation boundary conditions which have the following properties were constructed: to accurately simulate the radiation of energy out of the computational domain; to accomplish the simulation with an accuracy which improves as fast as feasible as the artificial surface is moved outward; and to accelerate convergence to the steady state (by minimizing spurious reflections).
T.M.

N81-33858*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A COMPARATIVE STUDY OF NONREFLECTING FAR-FIELD BOUNDARY CONDITION PROCEDURES FOR UNSTEADY TRANSONIC FLOW COMPUTATION
Dochan Kwak *In its* Numerical Boundary Condition Procedures Oct. 1981 p 21-44 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

Various nonreflecting far-field boundary condition procedures are compared by implementing them in the computer code LTRAN2. This code solves the implicit finite-difference representation of the small-disturbance equations for transonic flows about airfoils. The first- and second-approximate nonreflecting conditions, as proposed by Engquist and Majda, are compared with the condition derived from the full-characteristic equation. The far-field boundary conditions and the description of the algorithm for implementing these conditions in LTRAN2 are discussed. Various cases are computed and compared with results from the older, more conventional procedures. One concludes that the full-characteristic equation produces the most effective results, thus allowing the far-field boundary to be located closer to the airfoil; this decreases the computer time required to obtain the solution because fewer mesh points are required.
T.M.

N81-33859*# Illinois Univ., Urbana.
IMPLEMENTATION OF NONREFLECTIVE BOUNDARY CONDITION AT THE OUTFLOW BOUNDARY
D. R. Hall and S. M. Yen *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 45-60 refs (For primary document see N81-33856 24-64)
(Contract N00014-80-C-0740; Grant NSF ENG-77-20436)
Avail: NTIS HC A17/MF A01 CSCL 12A

Numerical techniques for the solution of free surface flows about a disturbance on or near a free surface were developed. Any disturbance moving on or near a liquid surface generates surface waves that propagate away from the disturbance. The potential flow problems in which the evolution of free surface waves is the principal phenomenon of interest are considered.

The distinct feature of these problems is that the position of the surface is also unknown and is to be determined as part of the solution. Two boundary conditions are required at the free surface since there are two unknown functions there, the free surface height and the potential function. The required boundary conditions are satisfied by the kinematic condition which states that no flow can cross the surface and the dynamic condition which matches the fluid pressure to the pressure acting on the surface through Bernoulli's equation. T.M.

N81-33860*# Douglas Aircraft Co., Inc., Huntington Beach, Calif.

RAPID, HIGH-ORDER ACCURATE CALCULATION OF FLOWS DUE TO FREE SOURCE OR VORTEX DISTRIBUTIONS

Douglas Halsey *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 61-71 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

Fast Fourier transform (FFT) techniques are applied to the problem of finding the flow due to source or vortex distributions in the field outside an airfoil or other two-dimensional body. Either the complex potential or the complex velocity may be obtained to a high order of accuracy, with computational effort similar to that required by second-order fast Poisson solvers. These techniques are applicable to general flow problems with compressibility and rotation. An example is given of their use for inviscid compressible flow. T.M.

N81-33861*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A PHYSICAL APPROACH TO THE NUMERICAL TREATMENT OF BOUNDARIES IN GAS DYNAMICS

Gino Moretti (GMAF, Inc.) *In its* Numerical Boundary Condition Procedures Oct. 1981 p 73-95 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

Two types of boundaries are considered: rigid walls, and artificial (open) boundaries which were arbitrarily drawn somewhere across a wider flow field. A set of partial differential equations (typically, the Euler equations) has an infinite number of solutions, each one defined by a set of initial and boundary conditions. The initial conditions remaining the same, any change in the boundary conditions will produce a new solution. To pose the problem well, a necessary and sufficient number of boundary conditions are prescribed. T.M.

N81-33862*# Grumman Aerospace Corp., Bethpage, N.Y.

THREE DIMENSIONAL BOUNDARY CONDITIONS IN SUPERSONIC FLOW

S. Rudman and F. Marconi *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 97-120 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

A theoretical analysis of the flow pattern at a solid surface in three dimensional supersonic flow is presented. The additional information necessary to overcome the nonuniqueness associated with the body tangency condition in three dimensions was developed. The analysis is based on the fact that three dimensional waves propagate locally exactly as they do in axisymmetric flow when viewed in the osculating plane to the streamline. The supersonic flow over an infinite swept corner is examined by both the classical solution and the three dimensional solution in the osculating plane and the results are shown to be identical. A simple numerical algorithm is proposed which accounts for the three wave surfaces that interact at a solid boundary. T.M.

N81-33863*# McDonnell-Douglas Corp., St. Louis, Mo.

ON VARIOUS TREATMENTS OF POTENTIAL EQUATIONS AT SHOCKS

Lee-Tzong Chen and D. A. Caughey *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 121-138 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

The potential equation that governs transonic inviscid flowfields is elliptic in subsonic regions and hyperbolic in supersonic regions. The transition from supersonic to subsonic flow may occur either continuously or across a surface of discontinuity known as a shock. Because of the changing type of governing equation and the presence of the surfaces of discontinuity, special treatments of the governing equations are needed at shocks to preserve mass conservation and to ensure satisfaction of the governing equation. In the so-called shock-capturing techniques, shocks are captured by smearing the discontinuity over several mesh cells in the computational domain. Most existing conservative schemes conserve mass flux throughout the flowfield, including shock boundaries; however, they also introduce zero-order errors in the approximation to the governing equation. It is shown that the zero-order errors, which do not diminish as the mesh spacing approaches zero, can cause discrepancies in the prediction of shock strength and location. These parameters are extremely sensitive features of transonic inviscid flowfield calculations. It is also shown that the zero-order errors can be avoided by developing higher-order schemes that properly model the governing equation at shocks. T.M.

N81-33864*# Naval Surface Weapons Center, White Oak, Md.

FULLY IMPLICIT SHOCK TRACKING

J. B. Bell, G. R. Shubin, and J. M. Solomon *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 139-163 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

A tracking method for solving hyperbolic free boundary problems arising in fluid dynamics is presented. The principal feature of the new approach is that the implicit form is used to simultaneously treat both interior points and boundary conditions. In particular, the location of the free boundary (shock) surface is treated implicitly and coupled with all other unknowns. The method is presented in the context of unsteady one-dimensional flow in a variable area duct with an internal shock wave. The fully implicit method and other strategies for advancing the shock are compared for computing a steady solution via a time asymptotic approach. Issues regarding extension of the method to multiple dimensions are also discussed. T.M.

N81-33865*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CHARACTERISTIC BOUNDARY CONDITIONS FOR THE EULER EQUATIONS

T. H. Pulliam *In its* Numerical Boundary Condition Procedures Oct. 1981 p 165-181 refs (For primary document see N81-33856 24-64)

Avail: NTIS HC A17/MF A01 CSCL 12A

The boundary conditions are demonstrated for the quasi-one-dimensional Euler equations with the extension to two and three dimensions being straightforward. In this application an implicit finite-difference scheme is employed with the boundary conditions being applied implicitly. The boundary application uses both characteristic extrapolations and evaluations which distinguishes it from other theories. Flow fields with shocks are calculated with inflow-outflow conditions of supersonic-subsonic and subsonic-subsonic flow. T.M.

N81-33866*# Rockwell International Science Center, Thousand Oaks, Calif.

NUMERICAL BOUNDARY CONDITION PROCEDURE FOR THE TRANSONIC AXISYMMETRIC INVERSE PROBLEM

Vijaya Shankar *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 183-197 refs (For primary document see N81-33856 24-64)

(Contract F49620-80-C-0081)

Avail: NTIS HC A17/MF A01 CSCL 12A

Two types of boundary condition procedures for the axisymmetric inverse problem are described. One is a Neumann type boundary condition (analogous to the analysis problem) and the other is a Dirichlet type boundary conditon, both requiring special treatments to make the inverse scheme numerically stable. The dummy point concept is utilized in implementing both. Results indicate the Dirichlet type inverse boundary condition is more robust and conceptually simpler to implement than the Neumann type procedure. A few results demonstrating the powerful capability of the newly developed inverse method that can handle both shocked as well as shockless body design are included. L.F.M.

N81-33867*# Tel-Aviv Univ. (Israel).
STABILITY OF TWO-DIMENSIONAL HYPERBOLIC INITIAL BOUNDARY VALUE PROBLEMS FOR EXPLICIT AND IMPLICIT SCHEMES
Saul S. Abarbanel and Earl M. Murman (MIT, Cambridge) *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 199-207 refs (For primary document see N81-33856 24-64)
(Contracts NCC1-45; NAS1-15810; NAS1-14101; Grants NGT-22-009-901; AF-AFOSR-0249-80)
Avail: NTIS HC A17/MF A01 CSCL 12A

Stable and unstable boundary conditions for various explicit and implicit schemes for the linear two-dimensional wave equations are discussed. Modal analysis is applied to the wave equations in half space in order to investigate the effect on numerical stability of outflow-type boundary conditions. L.F.M.

N81-33868*# Uppsala Univ. (Sweden). Dept. of Computer Science.
THE CHOICE OF NUMERICAL BOUNDARY CONDITIONS FOR HYPERBOLIC SYSTEMS
Bertil Gustafson *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 209-225 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

Two fundamental problems for mixed initial boundary value problems with applications in fluid mechanics are discussed. First, different stability properties are discussed which are of importance for long time integrations and steady state calculations. Secondly, a new numerical technique for problems with an artificial boundary is introduced. L.F.M.

N81-33869*# Sandia Labs., Albuquerque, N. Mex.
INFLUENCE OF BOUNDARY APPROXIMATIONS AND CONDITIONS ON FINITE DIFFERENCE SOLUTIONS
F. G. Blottner *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 227-256 refs (For primary document see N81-33856 24-64)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A17/MF A01 CSCL 12A

Numerical representations of boundary approximations and conditions for three problems are investigated to determine the resulting global accuracy of the steady state solution. Numerical accuracy with various boundary approximations is determined for quasi-one-dimensional inviscid flow in a duct with the interior grid points evaluated using the MacCormack scheme. When an extrapolation approximation with first order local truncation error is used, the global second order accuracy of the difference scheme can be destroyed. For one dimensional flow in a porous medium, an implicit midpoint difference scheme which is consistent with the boundary conditions is developed without the need of boundary approximations. A dissipative model problem is solved with the boundary conditions discretized with first and second order accuracy. The overall second order accuracy of the difference scheme is destroyed if first order numerical representation of one of the boundary conditions is used. With a boundary approximation, the second order global accuracy of the model problem is retained if either second order extrapolation or first order representation of the governing equation is used. Author

N81-33870*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STABILITY ANALYSIS OF NUMERICAL BOUNDARY CONDITIONS AND IMPLICIT DIFFERENCE APPROXIMATIONS FOR HYPERBOLIC EQUATIONS
R. M. Beam, R. F. Warming, and H. C. Yee *In its* Numerical Boundary Condition Procedures Oct. 1981 p 257-282 refs Also presented at the SIAM Natl. Meeting, Troy, N.Y., 8-10 Jun. 1981 (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

Implicit, noniterative, finite difference schemes were recently developed by several authors for multidimensional systems of nonlinear hyperbolic partial differential equations. When applied to linear model equations with periodic boundary conditions those schemes are unconditionally stable (A-stable). As applied in practice the algorithms often face a severe time step restriction. A major source of the difficulty is the treatment of the numerical boundary conditions. One conjecture was that unconditional stability requires implicit numerical boundary conditions. An apparent counter example was the space time extrapolation considered by Gustafsson, Kreiss, and Sunstrom. Spatial (implicit) and space time (explicit) extrapolation using normal mode analysis for a finite and infinite number of spatial mesh intervals are examined. The results indicate that for unconditional stability with a finite number of spatial mesh intervals, the numerical boundary conditions must be implicit. Author

N81-33871*# California Univ. at Los Angeles.
STABILITY THEORY OF DIFFERENCE APPROXIMATIONS FOR MULTIDIMENSIONAL INITIAL BOUNDARY VALUE PROBLEMS
Daniel Michelson *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 283-285 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

An attempt is made to generalize results for arbitrary multidimensional difference schemes. Severe obstacles are encountered, however, for dissipative difference schemes the problem may be resolved. L.F.M.

N81-33872*# Stuttgart Univ. (West Germany).
SOME EXPERIMENTS ON EXPLICIT BOUNDARY ALGORITHMS
K. Forester *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 287-312 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

Experiments done with the aim of improving the accuracy and efficiency of explicit boundary algorithms for quasilinear hyperbolic systems of partial differential equations in matrix form are described. Existing methods are criticized and a new approach to the problem is presented. L.F.M.

N81-33873*# Utah Univ., Salt Lake City. Dept. of Meteorology.
PSEUDOSPECTRAL METHOD FOR PROBLEMS WITH NONPERIODIC BOUNDARY CONDITIONS
H. N. Lee *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 313-321 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

The capability of the pseudospectral technique and the time integration scheme for the time dependent nonperiodic problem is demonstrated. Significant improvements are shown in the accuracy for calculation of the two dimensional time dependent advection diffusion equation. The pseudospectral method is a viable alternative to the finite difference methods for the equation of the spatial deriviations. L.F.M.

N81-33874*# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics
UNCONDITIONAL INSTABILITY OF INFLOW DEPENDENT BOUNDARY CONDITIONS IN DIFFERENCE APPROXIMATIONS TO HYPERBOLIC SYSTEMS
Eitan Tadmor *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 323-332 refs (For primary document see N81-33856 24-64)
(Contract DAAG29-80-C-0041)
Avail: NTIS HC A17/MF A01 CSCL 12A

The stability of finite difference approximations to initial boundary hyperbolic systems is studied. As is well known, a proper specification of boundary conditions for such systems is essential for their solutions to be well defined. A discrete analogue of the above is proved - if the numerical boundary conditions are consistent with an inflow part of the problem, they render the overall computation unstable. An example of the inviscid gasdynamics equations is considered. *Author

N81-33875*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPLICIT BOUNDARY CONDITIONS FOR THE SOLUTION OF THE PARABOLIZED NAVIER-STOKES EQUATIONS FOR SUPERSONIC FLOWS
M. Barnett, R. T. Davis, and J. V. Rakich *In its* Numerical Boundary Condition Procedures Oct. 1981 p 333-351 refs Prepared in cooperation with Cincinnati Univ. (For primary

document see N81-33856 24-64)
(Contracts NCA2-OR130-901; NCA2-OR130-101)
Avail: NTIS HC A17/MF A01 CSCL 12A

A fully implicit set of boundary conditions is developed for the solution of the parabolized Navier-Stokes equations for supersonic flow in two dimensions. Shock fitting is employed at the shock and the body has no-slip and specified temperature conditions. A specified heat transfer condition at the wall can be handled in a similar manner. In addition, the shock location is advanced in space in a fully implicit manner by utilizing the Rankine-Hugoniot conditions along with global conservation of mass. Author

N81-33876*# Massachusetts Inst. of Tech., Cambridge.
BOUNDARY TREATMENTS FOR IMPLICIT SOLUTIONS TO EULER AND NAVIER-STOKES EQUATIONS
W. T. Thompkins, Jr. and R. H. Bush *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 353-366 refs (For primary document see N81-33856 24-64)
(Grant NAG3-9)
Avail: NTIS HC A17/MF A01 CSCL 12A

It seems apparent that for inviscid calculations the differences between the explicit and implicit boundary formulations tested are far smaller than anticipated. New work should focus on understanding of how the convergence rate is limited or affected by boundary formulations. Since the inflow/outflow boundary treatments tested were simple extrapolations, it may be the case that treatments more closely representing the differential equations will prove to have superior convergence properties. However, several such improved boundary treatments were attempted with disappointing results. L.F.M.

N81-33877*# International Business Machines Corp., Palo Alto, Calif.
RIGOROUS NUMERICAL TREATMENT OF THE NO-SLIP CONDITION IN A VORTICITY FORMULATION
J. Gazdag, Y. Takao (IBM, Japan), and J. Fromm (IBM Research Lab., San Jose, Calif.) *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 367-377 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

It is shown that a rigorous mathematical treatment of the boundary conditions for rigid no-slip surfaces requires, in general, that two passes be made in solving Poisson's equation. A Fourier solution procedure was the key to this realization. It is also shown that a corresponding method exists for finite and, for the same local approximation, the usual one step method gives the same result for the geometry considered here. The more fundamental two step method gives a new insight into the physical significance of boundary vorticity. Author

N81-33878*# Hull Univ. (England).
NUMERICAL TREATMENT OF NONLINEAR LATENT HEAT BOUNDARY CONDITIONS AT MOVING INTERFACES IN GENUINE TWO DIMENSIONAL SOLIDIFICATION PROBLEMS
P. M. Beckett *In* NASA. Ames Research Center Numerical Boundary Condition Procedures Oct. 1981 p 379-388 refs (For primary document see N81-33856 24-64)
Avail: NTIS HC A17/MF A01 CSCL 12A

The proposed method for the treatment of two dimensional solidification problems is based on quasilinearization of the transformed heat conduction equation and latent heat condition at the interface and an iterative sequence in which these are solved simultaneously. Modern algorithms for solving such sparse systems mean that most of the storage advantage of other methods are reduced and the speed of solution can be improved. L.F.M.

N81-33879*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MULTIGRID METHODS
Oct. 1981 304 p refs Symp. held at Moffett Field, Calif., 21-22 Oct. 1981
(NASA-CP-2202; A-8738) Avail: NTIS HC A14/MF A01 CSCL 12A

Developments in numerical solution of certain types of partial differential equations by rapidly converging sequences of operations on supporting grids that range from very fine to very coarse are presented. For individual titles, see N81-33880 through N81-33894.

N81-33880*# Oregon State Univ., Corvallis. Dept. of Mathematics.
MULTILEVEL TECHNIQUES FOR NONELLIPTIC PROBLEMS
Dennis C. Jespersen *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 1-22 refs (For primary document see N81-33879 24-64)
(NCA2-OR586-001)
Avail: NTIS HC A14/MF A01 CSCL 12A

Multigrid and multilevel methods are extended to the solution of nonelliptic problems. A framework for analyzing these methods is established. A simple nonelliptic problem is given, and it is shown how a multilevel technique can be used for its solution. Emphasis is on smoothness properties of eigenvectors and attention is drawn to the possibility of conditioning the eigensystem so that eigenvectors have the desired smoothness properties. J.D.H.

N81-33881*# Boeing Military Airplane Development, Seattle, Wash.
ADVANTAGES OF MULTIGRID METHODS FOR CERTIFYING THE ACCURACY OF PDE MODELING
C. K. Forester *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 23-46 refs (For primary document see N81-33879 24-64)
(Contract NAS1-16408)
Avail: NTIS HC A14/MF A01 CSCL 12A

Numerical techniques for assessing and certifying the accuracy of the modeling of partial differential equations (PDE) to the user's specifications are analyzed. Examples of the certification process with conventional techniques are summarized for the three dimensional steady state full potential and the two dimensional steady Navier-Stokes equations using fixed grid methods (FG). The advantages of the Full Approximation Storage (FAS) scheme of the multigrid technique of A. Brandt compared with the conventional certification process of modeling PDE are illustrated in one dimension with the transformed potential equation. Inferences are drawn for how MG will improve the certification process of the numerical modeling of two and three dimensional PDE systems. Elements of the error assessment process that are common to FG and MG are analyzed. J.D.H.

N81-33882*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MULTIGRID METHOD WITH WEIGHTED MEAN SCHEME
Liviu R. Lustman, Quyen Huynh, and M. Y. Hussaini *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 47-59 refs Prepared in cooperation with Systems and Applied Sciences Corp., Hampton, Va. (For primary document see N81-33879 24-64)
(Contracts NAS1-16572; NAS1-16394)
Avail: NTIS HC A14/MF A01 CSCL 12A

Multigrid algorithms based on the weighted mean scheme are developed for the solution of the two dimensional incompressible Navier-Stokes equations. They are applied to two typical problems encountered in engineering applications, namely, the convection diffusion problem of the Benard convection cell, and the driven cavity problem. An analysis of the smoothing rates and stability is given. The efficiency of the multigrid method is investigated. Author

N81-33883*# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.
A MULTIGRID METHOD FOR THE TRANSONIC FULL POTENTIAL EQUATION DISCRETIZED WITH FINITE ELEMENTS ON AN ARBITRARY BODY FITTED MESH
Herman Deconinck and Charles Hirsch *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 61-81 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

A multigrid method for the acceleration of transonic potential flow calculations based on a Galerkin finite element approach is described. In order to allow the use of arbitrary body fitted meshes it is necessary to introduce nonuniform interpolation and

residual weighting. Emphasis is put on the construction of these operators consistent with the finite element approximation, while standard successive line overrelaxation is used as a smoothing step. Substantial convergence acceleration is obtained and results are presented for different transonic flow configurations including shocks. Author

N81-33884*# Royal Inst. of Tech., Stockholm (Sweden).
MULTIGRID SOLUTION OF THE NAVIER-STOKES EQUATIONS ON NONUNIFORM GRIDS
Laszlo Fuchs *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 83-100 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

The numerical solution of the Navier-Stokes equations in general two dimensional domains is considered. A proper finite difference approximation to the governing equations, on nonstaggered grids, in a transformed plane is formulated. Several aspects of a multigrid method for the solution of the finite difference equations are described. The efficiency of some relaxation schemes and the transfer among the grids which are nonuniform in the physical plane are emphasized. J.D.H.

N81-33885*# Cornell Univ., New York.
APPLICATIONS OF THE MULTIGRID METHOD TO CALCULATIONS OF TRANSONIC POTENTIAL FLOW ABOUT WING FUSELAGE COMBINATIONS
Arvin Shmilovich and D. A. Caughey *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 101-130 refs (For primary document see N81-33879 24-64)
(Contract N00014-77-C-0033)
Avail: NTIS HC A14/MF A01 CSCL 12A

The multigrid method is applied to the calculation of transonic, potential flow fields about arbitrary three dimensional wing-body combinations. Numerical results for iterative convergence rate are in good agreement with those predicted by a local mode analysis and show substantial improvement over conventional relaxation algorithms. Author

N81-33886*# Boeing Commercial Airplane Co., Seattle, Wash.
A MULTIGRID MESH EMBEDDING TECHNIQUE FOR THREE DIMENSIONAL TRANSONIC POTENTIAL FLOW ANALYSIS
Jeffrey J. Brown *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 131-149 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

A method for obtaining the fine detail of a transonic flowfield is presented. The technique employs the multigrid method to embed very dense meshes in regions of interest. Accurate results are obtained on meshes of a heretofore unobtainable density with reasonable computer expenditures. Comparisons of results with data reveal accurate predictions in the supersonic bubble of a transonic inlet, an area which is incorrectly predicted by existing techniques. More accurate results are also obtained with the new method on a mesh of a density comparable to existing codes and at a lower cost. Author

N81-33887*# National Aerospace Lab., Amsterdam (Netherlands).
A MULTIGRID ALGORITHM FOR STEADY TRANSONIC POTENTIAL FLOWS AROUND AEROFOILS USING NEWTON ITERATION
J. W. Boestoel *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 151-172 refs Sponsored by Netherlands Agency for Aerospace Programs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

The application of multigrid relaxation to transonic potential flow calculation was investigated. Conservative potential flows around aerofoils were taken as test problems. The solution algorithm was based on Newton iteration. It was found that the iteration to the circulation has to be kept outside the multigrid algorithm. To obtain meaningful norms of residuals, difference formulas with asymptotic scaling were introduced. Nonlinear instability problems were solved by upwind differencing using mass flux vector splitting instead of artificial viscosity or artificial density. It is suggested that the algorithms efficiency be increased by improving the iteration on the shock positions even though this is a highly nonlinear process. E.A.K.

N81-33888*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL MULTIGRID METHODS FOR ELLIPTIC EQUATIONS
Thomas A. Zang (Coll. of William and Mary, Williamsburg), Yau Shu Wong, and M. Y. Hussaini *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 173-191 refs (For primary document see N81-33879 24-64)
(Contracts NAS1-15810; NAS1-16394; Grant NAG1-109)
Avail: NTIS HC A14/MF A01 CSCL 12A

An alternative approach which employs multigrid concepts in the iterative solution of spectral equations was examined. Spectral multigrid methods are described for self adjoint elliptic equations with either periodic or Dirichlet boundary conditions. For realistic fluid calculations the relevant boundary conditions are periodic in at least one (angular) coordinate and Dirichlet (or Neumann) in the remaining coordinates. Spectral methods are always effective for flows in strictly rectangular geometries since corners generally introduce singularities into the solution. If the boundary is smooth, then mapping techniques are used to transform the problem into one with a combination of periodic and Dirichlet boundary conditions. It is suggested that spectral multigrid methods in these geometries can be devised by combining the techniques. E.A.K.

N81-33889*# Mathematisch Centrum, Amsterdam (Netherlands).
APPLICATION OF MULTIGRID METHODS FOR INTEGRAL EQUATIONS TO TWO PROBLEMS FROM FLUID DYNAMICS
H. Schippers *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 193-216 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

Multigrid methods were applied to fluid dynamic problems. The problems include calculation of potential flow around airfoils and oscillating disk flow. It is shown that in both cases the multigrid methods are sufficient to obtain an approximate solution while reducing the computational work. E.A.K.

N81-33890*# National Aerospace Lab., Amsterdam (Netherlands).
GENERAL RELAXATION SCHEMES IN MULTIGRID ALGORITHMS FOR HIGHER ORDER SINGULARITY METHODS
B. Oskam and J. M. J. Fray *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 217-234 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

Relaxation schemes based on approximate and incomplete factorization technique (AF) are described. The AF schemes allow construction of a fast multigrid method for solving integral equations of the second and first kind. The smoothing factors for integral equations of the first kind, and comparison with similar results from the second kind of equations are a novel item. Application of the MD algorithm shows convergence to the level of truncation error of a second order accurate panel method. E.A.K.

N81-33891*# National Center for Atmospheric Research, Boulder, Colo.
UNIGRID METHODS FOR BOUNDARY VALUE PROBLEMS WITH NONRECTANGULAR DOMAINS
W. Holland and S. McCormick (Colorado State Univ.) *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 235-247 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

Boundary value problems with nonrectangular domains were solved with unigrid methods. Unigrid was developed, its relationship to multigrid is described and some simple theory is presented. Its use is illustrated with a North Atlantic basin oceanographic model problem. It is demonstrated how unigrid (and, hence, multigrid) can be used efficiently with vector computers on problems with irregular domains. E.A.K.

N81-33892*# Los Alamos Scientific Lab., N. Mex.
BLACK BOX MULTIGRID
J. E. Dendy, Jr. *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 249-273 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

The black box multigrid (BOXMG) code, which only needs specification of the matrix problem for application in the multigrid method was investigated. It is contended that a major problem with the multigrid method is that each new grid configuration requires a major programming effort to develop a code that specifically handles that grid configuration. The SOR and ICCG methods only specify the matrix problem, no matter what the grid configuration. It is concluded that the BOXMG does everything else necessary to set up the auxiliary coarser problems to achieve a multigrid solution. E.A.K.

N81-33893*# Colorado State Univ., Fort Collins.
HIGH ORDER MULTI-GRID METHODS TO SOLVE THE POISSON EQUATION
Steve Schaffer *In* NASA. Ames Research Center Multigrid Method Oct. 1981 p 275-284 refs (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

High order multigrid methods based on finite difference discretization of the model problem are examined. The following methods are described: (1) a fixed high order FMG-FAS multigrid algorithm; (2) the high order methods; and (3) results are presented on four problems using each method with the same underlying fixed FMG-FAS algorithm. E.A.K.

N81-33894*# Sverdrup Technology, Inc., Arnold Air Force Station, Tenn.
ACCELERATED CONVERGENCE OF STRUCTURED BANDED SYSTEMS USING CONSTRAINED CORRECTIONS
Karl Kneile *In* NASA. Ames Research Center Multigrid Methods Oct. 1981 p 285-303 Sponsored in part by AFSC (For primary document see N81-33879 24-64)
Avail: NTIS HC A14/MF A01 CSCL 12A

An efficient iterative method for solving a structured banded system of equations is described. The method was developed for a full potential flow program and uses a basic interation step, a dynamic relation step, and a multigrid concept of constraining iterative corrections. The solution of a large linear system of equations is examined. Efficient iterative methods have become attractive for large problems. In the nonlinear cases, these iterations may be effectively merged to improve convergence rates. E.A.K.

N81-33895# Naval Ocean Systems Center, San Diego, Calif. Electronics Div.
THE MLE TRACKING ALGORITHM: A SUMMARY AND ERROR ANALYSIS Final Report, Dec. 1980 - Apr. 1981
M. J. Shensa 15 May 1981 27 p refs
(SF33341401)
(AD-A103427; NOSC/TR-689) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report discusses, in general, least-squares tracking algorithms and in particular the maximum likelihood estimator (MLE). Its primary concern is a detailed error analysis both from a deterministic point of view (sensitivity study) and a stochastic viewpoint (state variable covariance matrix). The latter results are shown to be equivalent to a Cramer-Rao bound, and their relationship to Kalman filters is cited. Various subtleties of interpretation are discussed including several theorems on confidence ellipsoids. Examples generated by computer software based on the theory are also presented. Author (GRA)

N81-33896# California Univ., Berkeley. Center for Pure and Applied Mathematics.
HORSESHOES AND ARNOLD DIFFUSION FOR HAMILTONIAN SYSTEMS ON LIE GROUPS
Philip J. Holmes and Jerrold E. Marsden 28 Jul. 1981 66 p refs
(Contract DAAG29-79-C-0086; Grant NSF ENG-78-02891)
(AD-A103562; PAM-49; ARO-16567.10-M; TR-16) Avail: NTIS HC A04/MF A01 CSCL 12/1

The Melnikov theory of perturbations of Hamiltonian systems containing homoclinic orbits is extended to systems containing canonical variables belonging to the coadjoint orbits of a Lie group. This is applied to the free rigid body with attachments and to the nearly symmetric top. These systems are thereby shown to have transverse homoclinic manifolds in an appropriate return map and therefore have complex dynamics. In particular, the heavy top and rigid body with one attachment are shown to contain horseshoes and therefore have no additional analytic integrals, while the rigid body with several attachments exhibits Arnold diffusion. Author (GRA)

N81-33897# California Univ., Berkeley. Center for Pure and Applied Mathematics.
MELKINOV'S METHOD AND ARNOLD DIFFUSION FOR PERTURBATION OF INTEGRABLE HAMILTONIAN SYSTEMS Interim Technical Report
Philip J. Holmes and Jerrold E. Marsden Jun. 1981 31 p refs
(Contract DAAG29-79-C-0086; Grant NSF ENG-78-02891)
(AD-A103563; PAM-41; ARO-16567.11-M; TR-15) Avail: NTIS HC A03/MF A01 CSCL 12/1

We start with an unperturbed system containing a homoclinic orbit and at least two families of periodic orbits associated with action angle coordinates. We use KAM theory to show that some of the resulting tori persist under small perturbations and use a vector of Melkinov integrals to show that, under suitable hypotheses, their stable and unstable manifolds intersect transversally. This transverse intersection is ultimately responsible for Arnold diffusion on each energy surface. The method is applied to a pendulum-oscillator systems. Author (GRA)

N81-33898# California Univ., Berkeley. Center for Pure and Applied Mathematicsj
HOMOCLINIC ORBITS, SUBHARMONICS AND GLOBAL BIFURCATIONS IN FORCED OSCILLATIONS Interim Technical Report
Bernie D. Greenspan and Philip J. Holmes 15 Jun. 1981 74 p refs
(Contract DAAG29-79-C-0086; Grant NSF ENG-78-02891)
(AD-A103564; PAM-45; ARO-16567.12-M; TR-14) Avail: NTIS HC A04/MF A01 CSCL 12/1

A method for the analysis of perturbations of integrable planar systems of differential equations is developed. Concentrating on the case in which the unperturbed system is Hamiltonian and the perturbation introduces dissipation and time-periodic forcing, the global solution curves of the unperturbed system are used in regular perturbation calculations to locate subharmonic orbits and homoclinic orbits and to characterize the bifurcations in which they are created as external parameters are varied. The results are applied to Duffing's equation and applications to the chaotic motions of buckled elastic beams undergoing periodic excitation are given. Author (GRA)

N81-33899# California Univ., Berkeley. Center for Pure and Applied Mathematicsj
HORSESHOES IN PERTURBATIONS OF HAMILTONIAN SYSTEMS WITH TWO DEGREES OF FREEDOM
Philip J. Holmes (Cornell Univ., Ithaca, N.Y.) and Jerrold E. Marsden May 1981 45 p refs
(Contract DAAG29-79-C-0086; Grants NSF ENG-78-02891; NSF MCS-78-06718)
(AD-A103565; PAM-38; ARO-16567-13-M-TR-13) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper concerns Hamiltonian and non-Hamiltonian perturbations of integrable two degree of freedom Hamiltonian systems which contain homoclinic and periodic orbits. Our main example concerns perturbations of the uncoupled system consisting of the simple pendulum and the harmonic oscillator. We show that small coupling perturbations with, possibly, the addition of positive and negative dampling breaks the integrability by introducing horseshoes into the dynamics. Author (GRA)

N81-33900# California Univ., Berkeley. Center for Pure and Applied Mathematics.
ANALYTICAL COMPLEXITY THEORY AND THE SOLUTION OF AX = B
B. N. Parlett Jun. 1981 23 p refs
(Contract N00014-76-C-0013)

(AD-A103479; PAM-40) Avail: NTIS HC A02/MF A01 CSCL 12/1

The conjugate gradient algorithm (called CG hereafter) is a popular way to solve large sparse positive definite systems of equations. The minimum residual algorithm (called MR) is closely related to CG and can be applied to any nonsingular system. In this summary we describe, our result and, of more importance, comment on their significance. The discussion is confined to exact arithmetic because this enquiry concerns only the theory of MR, CG and related algorithms, not their implementation.

GRA

N81-33901# Ballistic Research Labs., Aberdeen Proving Ground, Md.

VARIABLE TRANSFORMATION IN NONLINEAR LEAST SQUARES MODEL FITTING Final Report

Aivars Celmins Jul. 1981 48 p refs

(DA Proj. 1L1-61102-AH-43)

(AD-A103813; ARBRL-TR-02343) Avail: NTIS HC A03/MF A01 CSCL 12/1

The numerical treatment of nonlinear model fitting problems often can be simplified by manipulating the model equations. Algebraic manipulations, including nonlinear transformations of model parameters, do not change the numerical result of the adjustment. Therefore, such manipulations can be a powerful method to improve the performance of solution algorithms. Nonlinear transformations of the observations, on the other hand, do change the numerical results unless the normal equations are transformed accordingly. The latter transformation has been neglected by previous authors and this article provides a complete set of formulas that are needed to implement transformations of observations. The transformations are, however, in general less useful than parameter transformations but may have applications in particular situations. Author (GRA)

N81-33902# Army Armament Research and Development Command, Watervliet, N. Y.

A NEW VARIATIONAL METHOD FOR INITIAL VALUE PROBLEMS, USING PIECEWISE HERMITE POLYNOMIAL SPLINE FUNCTIONS

C. N. Shen and Julian J. Wu Aug. 1981 31 p refs

(AD-A104184; ARLCB-TR-81034) Avail: NTIS HC A03/MF A01 CSCL 12/1

A variational principle for a functional can be found which satisfies both the original system and its adjoint system. The variations of this functional give no boundary terms if the bilinear concomitant of the systems vanishes. For a second order time varying initial value problem, one can adjust the boundary conditions of the adjoint system in terms of the boundary conditions of the original system so that the bilinear concomitant is identically zero. An expression for the variation of the functional is derived which contains only the terms involving the variations of the adjoint variable and its derivative, but no variation of its second derivative. The variations of the adjoint variable and its derivative are found to be zeroes at the final conditions, just as the variations of the original variable and its derivative are zero at the starting (initial) conditions. This implies that we are able to solve the problem in one direction without worrying about the conditions at the other end as the initial value problem should be. the algorithm is much more simplified than in the past. An example is given to show the procedures of this new variational method. Author (GRA)

N81-33903# Army Mathematics Steering Committee.

PROCEEDINGS OF THE 1981 ARMY NUMERICAL ANALYSIS AND COMPUTERS CONFERENCE Interim Technical Report

Aug. 1981 629 p refs Conf. held at Redstone Arsenal, Ala., 26-27 Feb. 1981

(AD-A103920; ARO-81-3) Avail: NTIS HC A99/MF A01 CSCL 09/2

This is a technical report resulting from the 1981 Army Numerical Analysis and Computer Conference. It contains papers on Mathematical Software. GRA

N81-33904# Ohio State Univ., Columbus. Dept. of Geodetic Science.

NUMERICAL METHODS FOR HARMONIC ANALYSIS ON THE SPHERE

Oscar L. Colombo Mar. 1981 151 p refs

(Contract F19628-79-C-0027; AF Proj. 2309)

(AD-A104178; DGS-310; AFGL-TR-81-0038; SR-7) Avail: NTIS HC A08/MF A01

This report presents some numerical methods for estimating spherical harmonic coefficients from data sampled on the sphere. The data may be given in the form of area means or of point values, and it may be free from errors or affected by measurement 'noise'. The case discussed to greatest length is that of complete, global data sets on regular grids (i.e., lines of latitude and longitude, the latter, at least, separated by constant interval); the case where data are sparsely and irregularly distributed is also considered in some detail. The first section presents some basic properties of spherical harmonics, stressing their relationship to two-dimensional Fourier series. Algorithms for the evaluation of the harmonic coefficients by numerical quadratures are given here, and it is shown that the number of operations is the order of N cubed for equal angular grids, where N is the number of lines of latitude, or 'Nyquist frequency', of the grid. The second section introduces a quadratic measure for the error in the estimation of the coefficients by linear techniques. This is the error measure of least squares collocation, which is a method that can be used for harmonic analysis. Efficient algorithms for implementing collocation on the whole sphere are described. A formal relationship between collocation and least squares adjustment is used to obtain an alternative form of the collocation algorithm that is likely to be stable with dense data sets and, with a minor modification, can be used to implement least squares adjustment as well. The basic principle is that for regular grids the variance-convariance matrix of the data consists of Toeplitz-circulant blocks, so it can be both set up and inverted very efficiently. GRA

N81-33905# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.

A LAMBDA-CALCULUS MODEL FOR GENERATING VERIFICATION CONDITIONS

S. Kamal Abdali and Franz Winkler Jun. 1981 33 p refs

(Contract N00014-75-C-1026)

(AD-A103751; RPI-CS-8104) Avail: NTIS HC A03/MF A01 CSCL 09/2

A lambda-calculus-based method is developed for the automatic generation of verification conditions. A programming language is specified in which inductive assertions associated with a program are incorporated within the body of the program by means of assert and maintain-while statements. This programming language includes the following features: assignments, conditionals, loops, compounds, ALGOL-type block structure. A model is developed which consists of rules to translate each statement in this programming language into the lambda-calculus. The model is such that the lambda-expression translation of any program reduces to a list (tuple) of lambda-expression representations of all verification conditions of the program. A proof of this property is given. Author (GRA)

N81-33906# Stanford Univ., Calif. Dept. of Computer Science.

NUMERICAL SOLUTION OF THE BIHARMONIC EQUATION Ph.D. Thesis

Petter Erling Bjorstad Dec. 1980 141 p refs Sponsored in part by Norwegian Research Council

(Contracts N00014-75-C-1132; DE-AT03-76ER-71030)

(AD-A104084; SU-STAN-CS-80-834) Avail: NTIS HC A07/MF A01 CSCL 12/1

The numerical solution of discrete approximations to the first biharmonic boundary value problem in rectangular domains is studied. Several finite difference schemes are compared and a family of new fast algorithms for the solution of the discrete systems is developed. These methods are optimal, having a theoretical computational complexity of O(N2) arithmetic operations and requiring N2+O(N) storage locations when solving the problem on an N by N grid. Several practical computer implementations of the algorithm are discussed and compared. These implementations require a(sq N)+ b(sq N)logN airthmetic operations with b<<a. The algorithms take full advantage of vector or parallel computers and can also be used to solve a sequence of problems efficiently. A new fast direct method for

the biharmonic problem on a disk is also developed. It is shown how the new method of solution is related to the associated eigenvalue problem. The results of extensive numerical tests and comparisons are included throughout the dissertation.
Author (GRA)

N81-33907# Wisconsin Univ. - Madison. Mathematics Research Center.
A CONDITION NUMBER FOR LINEAR INEQUALITIES AND LINEAR PROGRAMS
O. L. Mangasarian Jun. 1981 19 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-01066)
(AD-A013848; MRC-TSR-2231) Avail: NTIS
HC A02/MF A01 CSCL 12/1

A new explicit bound is given for the ratio of the absolute error in an approximate solution of a system of linear inequalities and equalities to the absolute residual. This bound generalizes the concept of a norm of the inverse of a nonsingular matrix. With this bound a condition number is defined for a system of linear inequalities and equalities and for linear programs. The condition number gives a bound on the ratio of the relative error of an approximate solution to the relative residual. In the case of a strongly stable system of linear inequalities and equalities the condition number can be computed by means of a single linear program. GRA

N81-33908# Wisconsin Univ. - Madison. Mathematics Research Center.
MULTIPLE CRITICAL POINTS OF PERTURBED SYMMETRIC FUNCTIONALS
Paul Rabinowitz Jul. 1981 40 p refs
(Contracts DAAG29-80-C-0041; N00014-76-C-0300)
(AD-A103850; MRC-TSR-2233) Avail: NTIS
HC A03/MF A01 CSCL 12/1

Variational problems which are invariant under a group of symmetries often possess multiple solutions. This paper studies the effect of perturbations which are not small and which destroy the symmetry for two classes of such problems and shows how multiple solutions persist despite the perturbation. Author (GRA)

N81-33909# Wisconsin Univ. - Madison. Mathematics Research Center.
A CLASS OF LOCAL EXPLICIT MANY KNOT SPLINE INTERPOLATION SCHEMES Technical Summary Report
D. X. Qi Jul. 1981 15 p refs
(Contract DAAG29-80-C-0041)
(AD-A103851; MRC-TSR-2238) Avail: NTIS
HC A02/MF A01 CSCL 12/1

The purpose of this paper is to present a new local explicit method for an approximation of real-valued functions defined on intervals. The operators of the form Qf = sum over (lambda sub i) (f/q sub i,k) are studied under a uniform mesh, where (q sub i,k) comes from a linear combination of B-splines. This paper contains the definition of (q sub i,k), comments on its existence, proof of reproduction of the operator Q for appropriate classes of polynomials, and a note about some applications.
Author (GRA)

N81-33910# Wisconsin Univ. - Madison. Mathematics Research Center.
AN EXAMPLE OF THE USE OF ANDREWS' PLOTS TO DETECT TIME VARIATIONS IN MODEL PARAMETERS AND OUTLYING OBSERVATIONS Technical Summary Report
Agnes M. Herzberg (London Univ.) Jul. 1981 12 p refs
(Contract DAAG29-80-C-0041)
(AD-A103852; MRC-TSR-2239) Avail: NTIS
HC A02/MF A01

Andrews (1972) introduced a method of plotting high-dimensional data in two dimensions. In his method, Andrews represents each multidimensional point by a Fourier function. The clustering of plots of these functions is equivalent to the clustering of the multidimensional points. Andrews method is exploited as a graphical tool for exploratory data analysis for the examination of changes over time in the parameters of a time series model. An example using the total Canadian unemployment figures from 1956-1975 is used to illustrate the method. These data have four spurious (outlying) observations and it is shown how these may be detected by the use of Andrews' plots. GRA

N81-33911# Wisconsin Univ. - Madison. Mathematics Research Center.
ON BOUNDARY LAYER PROBLEMS IN THE THEORY OF ORDINARY DIFFERENTIAL EQUATIONS Technical Summary Report
Wolfgang R. Wasow Jul. 1981 114 p refs
(Contract DAAG29-80-C-0041)
(AD-A103857; MRC-TSR-2244) Avail: NTIS
HC A06/MF A01 CSCL 12/1

This research concerns linear ordinary differential equations depending in such a way on a parameter rho that the 'limit' differential equation obtained by letting rho tend to infinity in the differential equation is of lower order than the original one.
GRA

N81-33912# Wisconsin Univ. - Madison. Mathematics Research Center.
A DUAL DIFFERENTIABLE EXACT PENALTY FUNCTION Technical Summary Report
S.-P. Han and O. L. Mangasarian Aug. 1981 26 p refs
(Contract DAAG29-80-C-0041; Grants NSF MCS-79-01066; NSF ENG-79-03881)
(AD-A103859; MRC-TSR-2257) Avail: NTIS
HC A03/MF A01 CSCL 12/1

A new penalty function is associated with an inequality constrained nonlinear programming problem via its dual. This penalty function is globally differentiable if the functions defining the original problem are twice globally differentiable. In addition, the penalty parameter remains finite. This approach reduces the original problem to a simple problem of maximizing a globally differentiable function on the product space of a Euclidean space and the nonnegative orthant of another Euclidean space. Many efficient algorithms exist for solving this problem. For the case of quadratic programming, the penalty function problem can be solved effectively by successive overrelaxation (SOR) methods which can handle huge problems while preserving sparsity features. Author (GRA)

N81-33913# Wisconsin Univ. - Madison. Mathematics Research Center.
SMOOTHEST LOCAL INTERPOLATION FORMULAS FOR EQUALLY SPACED DATA
T. N. E. Greville and Hubert Vaughan Aug. 1981 30 p refs
(Contract DAAG29-80-C-0041)
(AD-A103860; MRC-TSR-2262) Avail: NTIS
HC A03/MF A01 CSCL 12/1

Let a moving-average interpolation formula for equally spaced data, exact for the degree r, have a basic function L e C to the m-1 power of finite support with L to the (m) power piecewise continuous. Such a formula is called 'smoothest' when the integral of the square of L to the (m) power over the support of L is smallest. If m, r, and the support of L are given, either there is no such formula or there is a unique smoothest formula, for which L is a piecewise polynomial of degree at least r and at most max(r, 2m - 1), uniquely characterized by certain conditions on the location of its knots and the jumps occurring there. A similar result is obtained if consideration is limited to formulas that preserve (i.e., do not smooth) the given data. GRA

N81-33914# Wisconsin Univ. - Madison. Mathematics Research Center.
VISCOSITY SOLUTIONS OF HAMILTON-JACOBI EQUATIONS
Michael G. Crandall and Pierre-Louis Lions Aug. 1981 69 p refs
(Contract DAAG29-80-C-0041)
(AD-A103862; MRC-TSR-2259) Avail: NTIS
HC A04/MF A01 CSCL 12/1

Problems involving Hamilton-Jacobi equations which we take to be either of the stationary form H(X,u,Du) = 0 or of the evolution form u sub t + H(x,t,u,Du) = 0, where Du is the spatial gradient of u - arise in many contexts. Classical analysis of associated problems under boundary and/or initial conditions by the method of characteristics is limited to local considerations owing to the crossing of characteristics. Global analysis of these

problems has been hindered by the lack of an appropriate notion of solution for which one has the desired existence and uniqueness properties. In this work a notion of solution is proposed which allows, for example, solutions to be nowhere differentiable but for which strong uniqueness theorems, stability theorems and general existence theorems, as discussed herein, are all valid.
GRA

N81-33915# Wisconsin Univ. - Madison. Mathematical Research Center.
BIFURCATION OF SINGULAR SOLUTIONS IN REVERSIBLE SYSTEMS AND APPLICATIONS TO REACTION-DIFFUSION EQUATIONS
M. Renardy Aug. 1981 47 p refs
(Contract DAAG29-80-C-0041)
(AD-A103864; MRC-TSR-2261) Avail: NTIS
HC A03/MF A01 CSCL 07/1

Dynamical systems that are reversible in the sense of Moser are investigated and bifurcation of trajectories connecting saddle points from stationary solutions is studied. As an application, reaction-diffusion models in one space dimension are considered. These equations are studied in the neighborhood of a point, where the set of spatially homogeneous solutions displays a Hopf bifurcation. It is shown that from such a point branches of solutions bifurcate, which can be described as waves travelling to or from a center. These waves may be exponentially damped at infinity or not. They can be regarded as one-dimensional analogues of 'target patterns' or 'spiral waves'.
Author (GRA)

N81-33916# Wisconsin Univ. - Madison. Mathematics Research Center.
SPARSITY-PRESERVING SOR ALGORITHMS FOR SEPARABLE QUADRATIC AND LINEAR PROGRAMMING
O. L. Mangasarian Aug. 1981 22 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-01066)
(AD-A103865; MRC-TSR-2260) Avail: NTIS
HC A02/MF A01 CSCL 12/1

The main purpose of this work is to give explicit sparsity-preserving SOR(Successive Overrelaxation) algorithms for the solution of separable quadratic and linear programming problems. The principal and computationally distinguishing feature of the present SOR algorithms is that they preserve the sparsity structure of the problem and do not require the computation of the product of the constraint matrix by its transpose as is the case in earlier SOR algorithms for linear and quadratic programming.
Author (GRA)

N81-33917# Wisconsin Univ. - Madison. Mathematics Research Center.
EXPLICIT FILTERS FOR DIFFUSIONS WITH CERTAIN NONLINEAR DRIFTS
Daniel L. Ocone, J. S. Baras (Maryland Univ., College Park), and S. I. Marcus (Texas Univ. at Austin) Aug. 1981 25 p refs
(Contracts DAAG29-80-C-0041; F49620-77-C-0101; N00014-79-C-0808; Grant NSF MCS-79-27062)
(AD-A103867; MRC-TSR-2254) Avail: NTIS
HC A02/MF A01 CSCL 12/1

A common problem in the analysis of stochastic systems is the estimation of the system's state given only noise-corrupted or incomplete observations. For instance, examples occur in communications theory when one wants to estimate a signal sent over a noisy channel. The problem of filtering is to build an estimate, i.e., filter, that provides the best information about the state given the observations. The most desirable solution to a filtering problem is a recursive, physically realizable algorithm that computes the best mean-square error estimate, and thus it is important to find models for which such algorithms exist. Recently, Benes defined a class of filtering problems that allow explicit computation of the conditional density of the signal given the past of the observations. This paper extends his result and then uses it to build exact, recursive algorithms for estimating any moment of the signal and for estimating polynomial-type transformations of the signal.
GRA

N81-33918# Wisconsin Univ. - Madison. Mathematics Research Center.
COSINE FAMILIES AND DAMPED SECOND ORDER DIFFERENTIAL EQUATIONS
James H. Lightbourne, III and Samuel M. Rankin, III Aug. 1981 30 p refs
(Contract DAAG29-80-C-0041; Grant NSF ISP-80-11453)
(AD-A103868; MRC-TSR-2256) Avail: NTIS
HC A03/MF A01 CSCL 12/1

A variation of constants formula is given for certain second order differential equations in a Banach space. The abstract results obtained can be applied to a class of damped semilinear hyperbolic partial differential equations; in particular, the existence and asymptotic behavior of solutions of such equations is examined.
GRA

N81-33919# Wisconsin Univ. - Madison. Mathematics Research Center.
ON THE HAAR AND WALSH SYSTEMS ON A TRIANGLE
Y. Y. Feng (Chinese Univ. of Science and Technology, Hofei) and D. X. Qi (Jilin Univ., Changchun, China) Jul. 1981 22 p refs
(Contract DAAG29-80-C-0041)
(AD-A103870; MRC-TSR-2235) Avail: NTIS
HC A02/MF A01 CSCL 12/1

A number of papers have been concerned with developing the theories of discontinuous orthonormal systems and their applications. In particular, the Haar and Walsh systems are presently the most important examples of nonsinusoidal functions, and have proved most useful in communication. Some authors have studied the properties of approximation from the mathematical point of view. It seems interesting and helpful for both theory and practice to investigate the Haar and Walsh functions for a multivariate setting. In fact, many signals in communications and other functions are of several variables (for instance, TV signals have two space variables and the time variable). If the domain of definition of the system is tensor product, then the existing systems are readily extended to several variables. The problem is how to construct an orthonormal system on a triangular domain in the plane, or more generally, on a simplex in n-dimensional space. This paper defines the Haar and Walsh system on a triangle domain, proves the orthogonality and completeness in L sub 2. Also the uniform convergence for the Haar-Fourier series, uniform convergence by group for the Walsh-Fourier series are studied. All of these results can be generalized easily to n dimensions.
GRA

N81-33920# Wisconsin Univ. - Madison. Mathematics Research Center.
MULTIPLE INTEGRAL EXPANSIONS FOR NONLINEAR FILTERING Ph.D. Thesis - MIT
Daniel L. Ocone Jun. 1981 47 p refs
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-3281-77; NSF MCS-79-27062)
(AD-A103873; MRC-TSR-2226) Avail: NTIS
HC A03/MF A01 CSCL 12/1

Multiple stochastic integral expansions are applied to the problem of filtering a signal observed in additive noise. It is shown that the optimal mean-square estimate may be represented as a ratio of two multiple integral series. A formula for expanding the product of two multiple integrals is developed and applied to deriving equations for the kernels of best, finite expansion approximations to the optimal filter. These equations are studied in detail in the quadratic case.
Author (GRA)

N81-33921# Wisconsin Univ. - Madison. Mathematics Research Center.
ON THE SOLUTION OF A CONSTRAINED MINIMIZATION PROBLEM IN H PRIME OMEGA RELATED TO DENSITY ESTIMATION
Nira Dyn (Tel-Aviv Univ.) and Wing Hung Wong (Chicago Univ., Ill.) Jun. 1981 15 p refs
(Contract DAAG29-80-C-0041; Grant DAAG29-77-G-0207)
(AD-A103874; MRC-TSR-2227) Avail: NTIS
HC A02/MF A01 CSCL 12/1

In this paper we study the problem of the minimization of the Dirichlet integral over a two-dimensional domain, by non-negative functions satisfying a finite number of linear constraints. Existence and uniqueness of the solution is provided. A characterization by variational inequality is given, leading to

local and boundary behaviour of the solution. This characterization is of importance in the construction of numerical algorithms for the production of non-negative smooth surfaces from aggregated data. Author (GRA)

N81-33922# Wisconsin Univ. - Madison. Mathematics Research Center.
A SEQUENCE OF PIECEWISE ORTHOGONAL POLYNOMIALS (II) Technical Summary Report
Y. Y. Feng (China Univ. of Science and Technology) and D. X. Qi (Jilin Univ.) Jun. 1981 18 p refs
(Contract DAAG29-80-C-0041)
(AD-A103876; MRC-TSR-2229) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper an orthonormal sequence of piecewise polynomials of degree k is given. We study the construction and sign-change properties of this sequence and consider the convergence of the corresponding Fourier series. The results generalize those obtained earlier for piecewise constant and piecewise linear functions. Author (GRA)

N81-33923# Wisconsin Univ. - Madison. Mathematics Research Center.
AN ALGORITHM FOR THE ONE-PHASE STEFAN PROBLEM Technical Summary Report
E. DiBenedetto (Indiana Univ., Bloomington) and R. Spigler (Univ. di Padova) Jul. 1981 32 p refs
(Contract DAAG29-80-C-0041)
(AD-A103880; MRC-TSR-2249) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm is proposed for solving one dimensional free boundary problems with change of phase. The technique consists of solving the heat equation in progressively increasing rectangles whose size is controlled by the Stefan condition. Convergence of the scheme is shown and an estimate of the rate of convergence is given. Author (GRA)

N81-33924# Wisconsin Univ. - Madison. Mathematics Research Center.
AN INTEGRAL OF PRODUCTS OF LEGENDRE FUNCTIONS AND A CLEBSCH-GORDAN SUM Technical Summary Report
Richard Askey Jul. 1981 8 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-01568)
(AD-A103881; MRC-TSR-2250) Avail: NTIS HC A02/MF A01 CSCL 12/1

New proofs and extensions are given of a sum considered by A. M. Din involving Clebsch-Gordan coefficients with zero magnetic quantum numbers and of an integral involving the product of three Legendre functions, one of the second kind. Author (GRA)

N81-33925# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A PERFORMANCE EVALUATION OF A CLASS OF RUNGE-KUTTA-CHEBYSHEV METHODS FOR SOLVING SEMIDISCRETE PARABOLIC DIFFERENTIAL EQUATIONS
B. P. Sommeijer and J. G. Verwer Sep. 1980 19 p refs
(MC-NW-91/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3

These are explicit methods and can thus be easily applied to multispace dimensional problems. On the other hand, the methods are conditionally stable. The real stability boundaries are proportional to m squared, m being the number of function evaluations per time step. Thanks to a property called internal stability, it is possible to integrate with an arbitrarily large value of m. Herewith the disadvantage of conditional stability can be significantly reduced. Author (ESA)

N81-33926# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
FOURIER ANALYSIS OF GRID FUNCTIONS, PROLONGATIONS AND RESTRICTIONS
P. W. Hemker Nov. 1980 39 p refs
(MC-NW-93/80) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

The elementary Fourier analysis of grid functions is presented in some detail. These grid functions are functions defined on an n-dimensional, rectangular, regularly spaced and infinite grid. The effect of operators of a general convolution type is considered; in particular prolongations and restrictions are studied. These are operators which transform functions on coarse to functions on fine grids, and vice versa. Special attention is payed to the combination of particular restrictions and prolongations. Author (ESA)

N81-33927# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
AN ALGOL 68 ROUTINE FOR THE APPROXIMATION OF PARTIAL DERIVATIVES ON A TWO DIMENSIONAL GRID
J. Kok Nov. 1980 34 p
(MC-NW-94/80) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4

The documentation of an ALGOL 68 routine is given. The routine computes weight matrices for the finite difference approximation of first and second order partial derivatives of two dimensional functions on a specified, not necessarily rectangular grid. The weight matrices can be used for the finite difference approximation of two-dimensional space derivatives appearing in partial differential equations (PDE's) and in accessory boundary conditions. By use of these weights the PDE can be transformed to a system of algebraic equations or a system of ordinary differential equations. The method is summarized; a derivative at a certain point is approximated using a general nine point discretization. Author (ESA)

N81-33928# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics
PRECONDITIONING AND COARSE GRID CORRECTIONS IN THE SOLUTION OF THE INITIAL VALUE PROBLEM FOR NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
P. J. vanderHouwen and H. B. deVries Dec. 1980 25 p refs Submitted for publication
(MC-NW-95/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

The numerical solution of nonlinear, time dependent partial differential equations is discussed. By the method of lines, an initial value problem for a system of ordinary differential equations is obtained to which an implicit linear multistep method is applied. Using Newton iteration, the nonlinear implicit relations are replaced by a sequence of linear equations. The linear problems are preconditioned by applying incomplete LU-decomposition and then solved by Jacobi iteration. The convergence is accelerated by introducing coarse grid corrections. Numerical examples are given and a comparison is made with other integration techniques. Author (ESA)

N81-33929# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
CONVERGENCE AND STABILITY ANALYSIS FOR MODIFIED RUNGE-KUTTA METHODS IN THE NUMERICAL TREATMENT OF SECOND KIND VOLTERRA INTEGRAL EQUATIONS
P. J. vanderHouwen, P. W. M. Wolkenfelt, and C. T. H. Baker (Manchester Univ., England) Dec. 1980 37 p refs Submitted for publication
(Grant SRC-GR/B23144)
(MC-NW-96/80) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

Modified and conventional Runge-Kutta methods for second kind Volterra integral equations are discussed in a uniform way. The modification presented takes into account the residual of the previous step with the aim of improving the stability behavior. A general convergence theorem is given which establishes that the modified methods may loose one order of accuracy. Furthermore, the stability behavior of the methods is analyzed and explicit stability results are derived. It transpires that every A-stable Runge-Kutta method for ordinary differential equations generates mixed methods which can be made A-stable by a suitable modification. Author (ESA)

N81-33930# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
COMPARING SOME ASPECTS OF TWO CODES FOR TWO-POINT BOUNDARY VALUE PROBLEMS
P. W. Hemker, H. Schippers, and P. M. Dezeeuw Dec. 1980

36 p refs Submitted for publication
(NC-NW-98/80) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

For the numerical solution of two-point boundary value problems, the codes PASVAR and COLSYS were tested on a variety of problems. Based on results, these codes are compared primarily as to how well they can handle difficulties caused by boundary layers, stiffness, nonlinearity and mesh selection. In particular, how well they are able to find an appropriate mesh in the case of boundary layers is considered. The criteria for the comparisons essentially are: (1) reliability; (2) number of coefficient function evaluations, etc.; and (3) overhead costs (time and space consumption). The problems and comparison criteria are specified carefully. The ease of use and extra features of the two codes are also discussed. Author (ESA)

N81-33931# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON EFFICIENCY OF FIRST AND SECOND ORDER
P. J. Bickel, D. M. Chibisov, and W. R. vanZwet Nov. 1980 13 p refs Submitted for publication
(Contract N00014-80-C-0163; Grant NSF MCS-76-10238)
(MC-SW-69/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

The asymptotic efficiency of tests is considered, specifically that first order efficiency implies second order efficiency. It has been noted that if two tests are asymptotically efficient for the same testing problem, then typically their powers will not only agree to first but also to second order. In these contributions, (N to the-1/2 power) efficiency is established by imposing the conditions needed to obtain expansions and then checking that these expansions are in fact identical. This method of proof makes an intuitive understanding of the phenomenon rather difficult. In order to provide such an intuitive understanding, a simple theorem of this kind is proven under mild assumptions. Since the aim is insight and not generality, only the simple hypothesis testing problem is described. A straightforward formal proof of the theorem is also given. Author (ESA)

N81-33932# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
ON THE APPLICATION OF AN EFFICIENT ALGORITHM FOR THE NUMERICAL LAPLACE INVERSION
G. Honig and U. Hirdes Aug. 1980 59 p refs
(JUEL-1672; ISSN-0366-0885) Avail: NTIS HC A04/MF A01

The theory and application of an inversion procedure based on a Fourier series expansion are described. By using efficient algorithms which reduce the discretization and truncation errors of the Fourier series approximation, and an algorithm determining the optical parameters of the procedure, results of a very high accuracy are achieved with only a few function evaluations of the Laplace transform. The variety of algorithms offered by this procedure allows its successful application over a wide range. Several examples of its use are demonstrated. The procedure is implemented as a FORTRAN subroutine (LAPIN) which can also be used as a black box. The available algorithms are selected automatically. Author (ESA)

N81-33933# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
EXTENSIONS OF LINEAR-QUADRATIC CONTROL THEORY
D. H. Jacobson, D. H. Martin, M. Pachter, and T. Geveci Mar. 1980 153 p refs In ENGLISH and AFRIKAANS Presented at NRIMS Summer Seminar Ser., 4-8 Feb. 1980
(PB81-216434; CSIR-TWISK-141) Avail: NTIS HC A08/MF A01 CSCL 12A

Contents: Review of linear dynamic systems, Canonical forms, pole assignment and state observers; Lyapunov stability theory; Linear quadratic optimal control; Introduction to Kalman filtering; The maximum principle and the Hamilton-Jacobi-Bellman equation; The nonconvex case; Controllability subject to controller constraints; Linear quadratic problems with conical control set; Special nonlinear quadratic formulations; Hybrid criteria and parameter sensitivity; Conditional definiteness of quadratic functionals; Exponential performance criteria and state dependent noise; Differential games: Optimal control of partial differential equations. GRA

N81-33128# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
MAXIMUM LIKELIHOOD IDENTIFICATION USING KALMAN-FILTERING VERSUS LEAST SQUARES ESTIMATION
G. Schulz *In* Hochschule der Bundeswehr Seminar On the Simulation and Optimization of Dyn. Systems Jun. 1981 p 42-51 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

N81-33129# Freie Univ., Berlin (West Germany).
A HYBRID METHOD FOR THE AUTOMATIC SPECIFICATION OF RATIONAL TRANSFER FUNCTION MODELS WITH ARIMA-AUTOCORRELATED ERRORS SUPERIMPOSED
H.-J. Lenz *In* Hochschule der Bundeswehr Seminar on the Simulation and Optimization of Dyn. Systems Jun. 1981 p 52-68 refs (For primary document see N81-33125 24-01)
Avail: NTIS HC A08/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N81-33934# Virginia Polytechnic Inst. and State Univ., Blacksburg.
AN OPTIMAL PROPERTY OF S(2) CHARTS
D. R. Jensen Jun. 1981 13 p refs
(Grant DAAG29-78-G-0172)
(AD-A103521; RR-Q-11) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let tau sub 1 be the class of all procedures for monitoring the variance of a process at level alpha using control charts based on statistics (T (Y1), T(Y2),...) from independent random samples. Suppose the conNol variance squared sigma sub zero is known. Under Gaussian assumptions the squared S chart using the sample variance is shown to be optimal in the class tau sub 1 in that its run length is stochastically smallest under both stationary and drifting processes not in control. Weaker properties are given in terms of stochastic bounds when squared sigma sub zero is not known and instead is estimated in a base period using the sample variance. Author (GRA)

N81-33935# Virginia Polytechnic Inst. and State Univ., Blacksburg.
PROPERTIES OF T(2) CHARTS IN MONITORING PROCESS MEANS
D. R. Jensen and Y. V. Hui Jun. 1981 34 p refs
(Grant DAAG29-78-G-0172)
(AD-A103636; RR-Q-10; ARO-15194.10-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

Hotelling's T squared and related charts are studied in monitoring the means of a multidimensional production process. The T squared chart is shown to be optimal in a class of procedures in that it signals more quickly than other procedures in the class when the process is not in control. Nonstandard properties of the distributions of run lengths of these charts are studied when (1) certain parameters are estimated in a base and modified procedures are followed using these estimates, (2) the process is a drifting process, and (3) the assumption of independent Gaussian vector observations is replaced by the assumption that the observations are generated from a spherical process. For these cases stochastic bounds on the actual run-length djstributions are given in terms of geometric distributions, and certain monotone properties of run lengths are established under driftings. Author (GRA)

N81-33936# Cornell Univ., Ithaca, N. Y. School of Operations Research and Industrial Engineering.
MULTIPLE-DECISION SELECTION AND RANKING PROCEDURES Final Report, 1 Nov. 1979 - 31 Jul. 1981
Robert E. Bechhofer 31 Jul. 1981 13 p refs
(Contract DAAG29-80-C-0036)

(AD-A103687; ARO-16322.10-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report lists papers that deal with research on the subject of 'Statistical multiple-decision ranking and selection procedures,' a statistical methodology pioneered by the Principal Investigator and several colleagues; some of the papers deal with related statistical techniques. Interest in this subject continues to grow as is evidenced by the large number of published papers in this area, and by the appearance in the last few years of three textbooks devoted exclusively to this subject. GRA

N81-33937# Purdue Univ., Lafayette, Ind. Dept. of Statistics.

ISOTONIC PROCEDURES FOR SELECTING POPULATIONS BETTER THAN A CONTROL UNDER ORDERING PRIOR

Shanti S. Gupta and Hwa-Ming Yang (Toledo Univ.) Jul. 1981 51 p refs

(Contract N00014-75-C-0455)

(AD-A103891; MMS-81-24) Avail: NTIS HC A04/MF A01 CSCL 12/1

The problem of selecting a subset containing all populations better than a control under an ordering prior is considered. Three new selection procedures which satisfy a desirable basic requirement on the probability of a correct selection are proposed and studied. Two of the three procedures use the isotonic regression over the sample means of the k-treatments with respect to the given ordering prior. Tables of constants which are necessary to carry out the selection procedures with isotonic approach for the selection of unknown means of normal populations are given. The results including Monte Carlo studies indicate that, in general, the stepwise procedure using isotonic estimators is the best. Author (GRA)

N81-33938# Wisconsin Univ. - Madison. Mathematics Research Center.

ON THE ESTIMATION OF A PROBABILITY DENSITY FUNCTION BY THE MAXIMUM PENALIZED LIKELIHOOD METHOD

B. W. Silverman (Bath Univ.) Jun. 1981 46 p refs

(Contract DAAG29-80-C-0041)

(AD-A103875; MRC-TSR-2228) Avail: NTIS HC A01/MF A01 CSCL 12/1

A class of probability density estimates can be obtained by penalizing the likelihood by a functional which depends on the roughness of the logarithm of the density. The limiting case of the estimates as the amount of smoothing increasing has a natural form which makes the method attractive for data analysis and which provides a rationale for a particular choice of roughness penalty. The estimates are shown to be the solution of an unconstrained convex optimization problem, and mild natural conditions are given for them to exist. Rates of consistency in various norms and conditions for asymptotic normality and approximation by a Gaussian process are given, thus breaking new ground in the theory of maximum penalized likelihood density estimation. Author (GRA)

N81-33939# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.

ON THE EDGEWORTH EXPANSION FOR THE SIMPLE LINEAR RANK STATISTIC

W. R. vanZwet (Leiden Univ.) Nov. 1980 24 p refs Submitted for publication

(MC-SW-70/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3.15

The behavior of the characteristic function of a properly standardized simple linear rank statistic for large values of the argument is considered. Under mild assumptions on the statistic and on the underlying probability distributions, an upper bound for this characteristic function is obtained. This result makes it possible to obtain an Edgeworth expansion for the simple linear rank statistic. Author (ESA)

N81-33940# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.

HOW PROBABLE IS IT TO BE FIRSTBORN? AND OTHER BRANCHING PROCESS APPLICATIONS TO KINSHIP PROBLEMS

Peter Jagers 1980 22 p refs Sponsored by Swedish Natural Science Foundation

(CTH-Math-1980-16) Avail: NTIS HC A02/MF A01

A general method of branching processes solving kin number problems was developed. For an individual sampled randomly from a stable, exponentially growing population, the probability of being firstborn and the probability distribution of number of siblings, cousins, etc., are considered. The distribution of the number of nth cousins is derived, as is the probability of having a living mother. Demographic are derived under general conditions. Results show rank and siblingship distribution for a given age. It is shown that the probability of being first or lastborn is very high in populations with a moderate growth. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N81-33941# Colorado Univ., Boulder. Center for Research on Judgment and Policy.

DETECTION OF MULTIPLICATIVE SYNERGISMS IN SIMULATED DATA FOR NONORTHOGONAL DESIGNS: WHAT LIES BEYOND LINEARITY?

James Shanteau Aug. 1981 69 p refs Prepared in cooperation with Kansas State Univ., Manhattan

(Contracts N00014-77-C-0336; PHS-RR-07013; NR Proj. 197-038)

(AD-A104004; CRJP-235) Avail: NTIS HC A04/MF A01 CSCL 12/2

A three stage simulation was conducted to evaluate the impact that multiplicative synergisms have within nonorthogonal (regression) designs. In the first stage, various designs with differing cue intercorrelations and number of stimulus cases were generated. In the second stage, several response strategies were simulated, including adding, multiplying, and adding-multiplying strategies. In the final stage, various research techniques, involving both descriptive and inferential analyses, were applied to analyze the simulated data. The results revealed that (1) while synergisms produce notable effects throughout the range of intercorrelation values, the most striking influence was found for negative intercorrelations; (2) descriptive indices (such as R2) were relatively unrevealing about the presence of synergisms; (3) in contrast, inferential indices (particularly the hierarchical test) were much more revealing; and (4) there were considerable between-stimulus difference in terms of how easily synergisms could be accurately detected. These findings imply that, because synergisms have been frequently overlooked by investigators, they should be specifically tested for in future research using nonorthogonal designs. Author (GRA)

N81-33942# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.

COMPLEXITY RESULTS FOR SCHEDULING TASKS IN FIXED INTERVALS ON TWO TYPES OF MACHINES

K. Nakajima (Texas Tech. Univ.), S. L. Hakimi (Northwestern Univ.), and J. K. Lenstra Dec. 1980 19 p refs Submitted for publication

(MC-BW-131/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum Amsterdam FL 3.15

A natural generalization of the fixed job schedule problem is considered. Potential applications in areas as vehicle scheduling, machine scheduling, and computer wiring are pointed out. Each task requires a given processing time on a slow machine or a given smaller processing time on a fast machine. Two different feasibility assumption are made: (1) each task has a specified processing interval, the length of which is equal to the processing time on a slow machine; (2) each task has a specified starting time. For either problem type, a feasible schedule of minimum total machine cost is sought. The results are complemented by polynomial algorithms for special cases. Author (ESA)

N81-33943# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.

TWO LINES LEAST SQUARES

A. K. Lenstra, J. K. Lenstra, A. H. G. Rinnooy Kan, and T. J. Wansbeek Jan. 1981 17 p refs Submitted for publication

(MC-BW-134/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

The standard single line least squares problem for n points in the plane known to be solvable in linear time was studied. Two generalizations of this problem in which two lines have to be constructed in such a way that after a certain assignment of each point to one of the lines the sum of squared vertical distances is minimal were considered. Polynomial time algorithms for the solution of these problems are presented. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N81-33944# Wisconsin Univ. - Madison. Mathematics Research Center.

ACCELERATION WAVE PROPAGATION IN HYPERELASTIC RODS OF VARIABLE CROSS-SECTION Technical Summary Report

A. Jeffrey (Newcastle-upon-Tyne Univ.) Jul. 1981 23 p refs (Contract DAAG29-80-C-0041)
(AD-A103878; MRC-TSR-2247) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that when an acceleration wave propagates in a hyperelastic rod with slowly varying cross-section, the transport equation for the wave intensity is a generalized Riccati equation. The three coefficients in the equation all depend on the material properties, but only the coefficient of the quadratic term is independent of the effect of area change. Three theorems are proved, based on the use of comparison equations, which establish that in general the acceleration wave intensity will become infinite (escape) after the wave has propagated only a finite distance along the rod. The existence of thresholds for the initial intensity are also established in certain cases, with their most notable property being that as the initial intensity decreases towards the threshold, so the distance the wave propagates to escape increases without bound. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N81-33945*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FLIGHT TEST OF A PURE-TONE ACOUSTIC SOURCE

Arnold W. Mueller and John S. Preisser Oct. 1981 39 p refs (NASA-TP-1898; L-14600) Avail: NTIS HC A03/MF A01 CSCL 20A

Static and flight testing of a pure-tone acoustic source were conducted in order to: (1) determine if a 4-KHz tone radiated by a source in flight and mixed with broadband aircraft flyover noise could be measured on the ground with a high degree of statistical confidence; (2) determine how well a comparison could be made of flight-to-static tone radiation pattern and a static radiation pattern; and (3) determine if there were any installation effects on the radiation pattern due to the flight vehicle. Narrow-band acoustic data were measured and averaged over eight microphones to obtain a high statistical confidence. The flight data were adjusted to an equivalent static condition by applying corrections for retarded time, spherical spreading, atmospheric absorption, ground impedance, instrumentation constraints, convective amplification, and the Doppler shift. The flight-to-static results are in excellent agreement with the measured static data. No installation effects were observed on the radiation pattern. M.G.

N81-33946*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

NOISE SUPPRESSION CHARACTERISTICS OF PERIPHERALLY SEGMENTED DUCT LINERS

Willie R. Watson Sep. 1981 43 p refs
(NASA-TP-1904; L-14521) Avail: NTIS HC A03/MF A01 CSCL 20A

The acoustic fields and transmission losses produced in semi-infinite circular ducts with peripherally segmented liners are analyzed using a series expansion of hard-wall duct modes. The coefficients of the series are computed using Galerkin's method. Unlike finite element approaches, this analysis includes the effects of realistic sources and the number of peripheral strips need not be small. It is shown that peripherally segmented liners redistribute the acoustic energy in waves composed of only a single circumferential mode at the source into other waves which contain a multitude of circumferential modes in the lined section. The accuracy of eigenfunctions computed from the analysis was observed to increase as either the frequency or radial mode order increased. The transmission losses were found to be accurate at frequencies above the cut-on value of the first-order radial mode in a hard-wall duct. The results show that for plane wave sources, peripherally segmented liners may attenuate as much sound as an optimized uniform liner at the optimal point while giving more noise suppression at most other frequencies. M.G.

N81-33947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAM TO PREDICT AIRCRAFT NOISE LEVELS

Bruce J. Clark Sep. 1981 146 p
(NASA-TP-1913; E-733) Avail: NTIS HC A07/MF A01 CSCL 20A

Methods developed at the NASA Lewis Research Center for predicting the noise contributions from various aircraft noise sources were programmed to predict aircraft noise levels either in flight or in ground tests. The noise sources include fan inlet and exhaust, jet, flap (for powered lift), core (combustor), turbine, and airframe. Noise propagation corrections are available for atmospheric attenuation, ground reflections, extra ground attenuation, and shielding. Outputs can include spectra, overall sound pressure level, perceived noise level, tone-weighted perceived noise level, and effective perceived noise level at locations specified by the user. Footprint contour coordinates and approximate footprint areas can also be calculated. Inputs and outputs can be in either System International or U.S. customary units. The subroutines for each noise source and propagation correction are described. A complete listing is given. A.R.H.

N81-33948# Transportation Systems Center, Cambridge, Mass.

HELICOPTER NOISE ANALYSIS: ROUND-ROBIN TEST Final Report, Jan. 1980 - May 1981

Edward J. Rickley Aug. 1981 79 p refs
(AD-A103724; TSC-FAA-81-13; FAA-AEE-81-13) Avail: NTIS HC A05/MF A01 CSCL 20/1

This report documents the results of an international round robin test on the analysis of helicopter noise. Digital spectral noise data of a 3.5 second simulated helicopter flyover and identical analog test tapes containing helicopter noise data, reference signals, test tones and time code signals were sent to 13 participating organizations. The purpose of the test was to evaluate data reduction systems and procedures; to determine the magnitude of the variability between representative systems and organizations; and to identify potential causes and assist in establishing recommended procedures designed to minimize the variablity. Author (GRA)

N81-33949# Army Test and Evaluation Command, Fort Huachuca, Ariz.

SOUND LEVEL MEASUREMENTS Final Report

17 Jul. 1981 39 p refs

(AD-A103819; TOP-1-2-608) Avail: NTIS HC A03/MF A01 CSCL 20/1

This report describes procedures for measuring the sound levels of developmental and production materiel as a means of evaluating personnel safety, recognition and community annoyance (by a drive-by test). It covers tests for steady-state noise from military vehicles and general equipment, and impulse noise from weapon systems and explosive ordnance material. Author (GRA)

N81-33950# Naval Underwater Systems Center, New London, Conn.

LOW FREQUENCY SOUND ABSORPTION IN SEA WATER: A NEW CHEMICAL RELAXATION

D. G. Browning, R. H. Mellen, and V. P. Simmons 1 Sep. 1981 20 p refs Presented at Meeting of the 101st Acoust. Soc. of Am., Ottawa, 18-22 May 1981

(AD-A103912; NUSC-TD-6547) Avail: NTIS HC A02/MF A01 CSCL 20/1

This document presented the oral and visual presentation entitled 'Low Frequency Sound Absorption in Sea Water: A New Chemical Relaxation Mechanism?,' presented at the 101st Meeting of the Acoustical Society of America, 18-22 May 1981, in Ottawa, Ontario, Canada. Excess sound absorption in sea water arises mainly from chemical relaxations involving MgSO4 and B(OH)3. The high-frequency (100 kHz) MgSO4 relaxation has been identified as a multistep ion-pair process. The low frequency (1 kHz) and B(OH)3 relaxation apparently involves more complex interactions with other constituents. To investigate B(OH)3 interactions in a simpler system, we measured absorption in NH3 solution using the resonator method. We have found alpha max to be proportional to the product of NH(+) and B(OH)4(-) concentrations; however, the magnitude is much too large to be caused by the ion pair. The mechanism, probably similar to that in sea water, resembles catalysis, the absorption being governed by the large volume change of the faster NH3/NH4(+) equilibrium and the relaxation frequency by the slower B(OH)3/B(OH)4(-) equilibrium. Author (GRA)

N81-33951# Naval Underwater Systems Canter, New London, Conn. Dept. of Surface Ship Sonar.

A STUDY OF THE SPACE AND TIME STABILITY OF A NARROWBAND LONG-RANGE ACOUSTIC SIGNAL IN THE OCEAN

D. G. Browning, P. D. Herstein, and P. D. Koenigs 1 Sep. 1981 17 p Presented at the 100th Meeting of the Acoust. Soc. of Am., Los Angeles, 20 Nov. 1980

(AD-A104159; NUSC-TD-6541) Avail: NTIS HC A02/MF A01 CSCL 17/1

A study is made of the stability of the principal parameters of a narrowband acoustic signal transmitted over a long range to a field of receivers. Measurement is made of the center frequency, bandwidth, and peak intensity as a function of both space and time. The relative stability of each parameter is determined and the possibility of identifying a single disturbance event is discussed. Author (GRA)

N81-33952# Southwest Research Inst., San Antonio, Tex. Instrumentation Research Div.

ULTRASONIC TRANSDUCER PERFORMANCE REQUIREMENTS, PHASE 3 Final Engineering Report, Jun. 1979 - Aug. 1981

Hegeon Kwun, Gary L. Burkhadt, and Cecil M. Teller Aug. 1981 46 p refs

(Contract F41608-79-D-A011; SRI Proj. 15-5711)

(AD-A103780) Avail: NTIS HC A03/MF A01 CSCL 14/2

Simplified test methods are presented for assessing performace parameters of 5 and 10 MHz contact type ultrasonic transducers used in Air Force field and depot level nondestructive inspection. Ultrasonic transducer performance parameters covered are: Overall Appearance, Beam Exit Point, Beam Angle, Skew Angle, Beam Divergence Angle, Center Frequency, Pulse Length, Dead Zone, Signal-to-Noise Ratio, and Overall System Sensitivity. Requirements are given for the ultrasonic instrument to be used for the tests. The importance of maintaining an initial excitation pulse to certain specified conditions, such as a spike or single cycle bipolar spike with duration less than 0.5 mircrosec, to achieve uniformity and instrumentally unbiased test results is addressed, methods are also described for establishing a specified initial excitation pulse by adjusting control on the ultrasonic instrument. Author (GRA)

N81-33953# Illinois Univ. at Urbana. Coordinated Science Lab.

RESEARCH TO PROVIDE A THEORETICAL DETERMINATION OF SURFACE ACOUSTIC WAVE VELOCITY AND IMPEDANCE DIFFERENCES BETWEEN METAL STRIPS AND FREE SURFACE REGIONS OF METALLIC GRATINGS Final Report

Griffiss AFB, N.Y. RADC Jul. 1981 56 p refs

(Contract F19628-78-C-0040; AF Proj. 2305)

(AD-A103928; RADC-TR-81-173) Avail: NTIS HC A04/MF A01 CSCL 09/3

With the advent of surface acoustic wave resonators and withdrawal weighted filters, quantitative knowledge of the velocity and acoustic impedance differences between metal strips and free surface regions in metallic gratings used for these structures has become necessary. During the course of this program mass loading, topographical effects, electrical loading, and energy storage have been considered and the surface acoustic wave velocity and impedance differences (DELTERV and DELTERZ) have been theoretically determined for shorted arrays, single electrode transducers and double electrode transducers at center frequency. Buried electrodes are also considered. It was an objective to find the electrode structure that produced the minimum impedance and velocity perturbation. It has been found that acoustic impedance mismatch and velocity shift, unlike in a transmission line, are not minimized simultaneously. Combinations of electrode metals are suggested for minimizing each of the perturbations. The results are presented in a form that is useful in the transmission line model analysis of SAW devices.

Author (GRA)

N81-33954# Swedish Inst. for Materials Testing, Boras. Acoustical Lab.

MEASUREMENT OF INSERTION LOSS OF DUCTED SILENCERS

Lasse Iho and Hans Jonasson 21 May 1980 84 p Sponsored by AB Bahco Ventilation, Stifab AB and Flaekt-Enaporator AB (SP-RAPP-1980:12) Avail: NTIS HC A05/MF A01

Measurements were carried out with different sound sources, with and without terminating transmission element, with and without vibration isolation, with different duct lengths and with different transition elements at different positions. Testing was done in the 1/3 octave band in a reverberation room. The Based on the conclusions, a revised method for measuring the transmission loss of ducted silencers without air flow is proposed. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N81-33955# ARO, Inc., Arnold Air Force Station, Tenn.

COMPUTER MODELING OF LASER-EXCITED MOLECULAR AND ATOMIC MOLECULAR SYSTEM Final Report, 1 Oct. - 1 Sep. 1980

D. H. Campbell AEDC Aug. 1981 47 p refs Sponsored by AF

(AD-A103662; AEDC-TR-80-47) Avail: NTIS HC A03/MF A01 CSCL 07/4

The potential application of the laser-induced fluorescence method for determining number densities and temperatures of gas species is investigated through computer modeling of the detailed relaxation of laser-excited molecular and atomic-molecular systems. The rate equation models for a sodium-diatomic molecular system and a single diatomic molecule system are explained and applied to the case of sodium-nitrogen and pure carbon monoxide. Author (GRA)

N81-33956# Auburn Univ., Ala. Dept. of Physics.

INTENSE PULSED PROTON SOURCE (TIME AND WAVELENGTH RESOLVED STUDIES OF XENON, LIQUID XENON,

AND XeF2) Final Contractors Report, 31 May 1979 - 29 Jan. 1981
John R. Williams and James E. Gaiser 26 Jun. 1981 103 p refs Revised
(Contract DASG60-79-C-0079)
(AD-A104094) Avail: NTIS HC A06/MF A01 CSCL 07/4

Time and wavelength resolved spectroscopic measurements have been performed for xenon gas excited by 2.0 MeV protons. Reaction rate constants for the formation and decay of the 3 Sigma sub u and the 1 Sigma sub u states in Xe sub 2* via three body collisions are 31 Hz/Torr square and 61 Hz/torr square, respectively. A kinetic model based on the experimental facts is presented and is examined. The lifetime of the 3 Sigma sub u state in Xe sub 2* has been measured to be 102 ns. Single proton counting techniques were used, and both the 172 nm radiation from the 3 Sigma sub u state as well as the 152 nm radiation from the 1 Sigma sub u state were monitored as a function of time and pressure. The rate constants of interest have been extracted from the pressure dependence of the decay times. Ion recombination kinetic processes were clearly distinguishable at higher pressures and could be dealt with independently from the excited state channel reactions. Tests were performed to insure that events which occur late in time following excitation were actually ion recombination processes. Absolute conversion efficiencies were measured for proton energy input to 172 nm proton energy output. GRA

N81-33957# Los Alamos Scientific Lab., N. Mex.
COMMENT ON S-MATRIX PARAMETERIZATIONS IN NN-SCATTERING
P. J. Mulders Aug. 1981 4 p refs
(Contract W-7405-eng-36)
(DE81-027934; LA-8879-MS) Avail: NTIS HC A02/MF A01

The parameterization of the S-matrix used for the elastic part of the NN-scattering matrix in the interactive nucleon-nucleon program SAID is described. It is not general enough to parameterize any 2 by 2 submatrix of a unitary matrix. DOE

N81-33958# Texas Univ. at Austin.
MEASUREMENT OF THE FREE NEUTRON-PROTON ANALYZING POWER AND SPIN-TRANSFER PARAMETERS IN THE CHARGE-EXCHANGE REGION AT 790 MEV
Ronald Dean Ransome Jul. 1981 240 p refs Sponsored by Los Alamos Scientific Lab.
(Contract W-7405-eng-36)
(DE81-028664; LA-8919-T) Avail: NTIS HC A11/MF A01

The free neutron-proton analyzing power and the spin transfer parameters (K sub NN, K sub SS, K sub SL, and K Sub LI) were measured at 790 MeV between 165 and 180 deg center of mass. A 40% polarized neutron beam incident on a liquid hydrogen target was used. The recoil protons were momentum analyzed with a magnetic spectrometer to isolate elastic scatters. A large solid angle carbon polarimeter was used to measure the proton polarization. The measurements are the first of this energy and are in basic agreement with pre-existing phase shift solutions. The proton-carbon analyzing power was measured between 500 and 750 MeV. An empirical fit to the proton-carbon analyzing power between 100 and 750 MeV was done. DOE

N81-33959# Argonne National Lab., Ill.
SPIN EFFECTS IN E+ E- ANNIHILATIONS
Dennis Sivers 1980 11 p refs Presented at the Intern. Symp. on H.E. Phys. with Polarized Beams and Polarized Targets, Lausanne, Switzerland, 25 Sep. 1980
(Contract W-31-109-eng-38)
(DE81-024457; ANL/HEP/CP-80-69; CONF-800994-17) Avail: NTIS HC A02/MF A01

Methods for confronting current theoretical ideas with experiments involving polarized e+e- beams are examined. Despite limitations, such experiments can be informative and justifiable. DOE

N81-33960# Argonne National Lab., Ill.
ELECTRON SPECTRA AND STRUCTURE OF ATOMIC AND MOLECULAR CLUSTERS
P. M. Dehmer 1980 6 p refs Presented at the Conf. on Phys. and Chem. of Energy-Related Atmospheric Pollution, Harper's Ferry, W. Va., 21-23 Apr. 1980
(Contract W-31-109-eng-38)
(DE81-023544; CONF-8004161-1) Avail: NTIS HC A02/MF A01

Changes in electronic structure that occur during the stepwise transition from gas phase monomers to large clusters which resemble the condensed phase were studied. This basic information on weakly bound clusters is critical to the understanding of such phenomena as nucleation, aerosol formation, catalysis, and gas-to-particle conversion, yet there exist almost no experimental data on neutral particle energy levels or binding energies as a function of cluster size. DOE

N81-33961# Argonne National Lab., Ill.
PHOTOIONIZATION OF ATOMIC IODINE AND ATOMIC TELLURIUM
J. Berkowitz, C. H. Batson, and G. L. Goodman 1980 4 p refs Presented at 6th Intern. Conf. on Vacuum Ultraviolet Radiation Phys., Charlottesville, Va., 2 Jun. 1980
(Contract W-31-109-eng-38)
(DE81-023546; CONF-800626-8) Avail: NTIS HC A02/MF A01

The photoionization yield curve is presented for atomic iodine from 645 A to the ionization threshold, made using a thermal atomic beam source and photoionization mass spectrometry. This information is also presented for tellurium from 670 A to the ionization threshold. DOE

N81-33962# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
EXPERIMENTAL EVIDENCE AND THEORETICAL IMPLICATIONS OF FLUCTUATIONS IN DEEP INELASTIC HEAVY ION COLLISIONS
L. G. Moretto Apr. 1981 26 p refs Presented at the Europhys. Conf. on Nucl. Phys., Hvar, Yugoslavia, 29 Jun. - 3 Jul. 1981
(Contract W-7405-eng-48)
(DE81-025329; LBL-12596; CONF-8106114-1) Avail: NTIS HC A03/MF A01

The role of fluctuations in deep inelastic collisions is discussed. The relevance of the statistical equilibrium limit to the description of substantially relaxed degrees of freedom is assessed. The effects of fluctuations are considered specifically for: (1) the correlation between entrance-channel angular momentum and exit-channel kinetic energy; (2) the sharing of the dissipated kinetic energy between the two fragments; (3) the alignment of the fragment angular momentum. It is found that statistical fluctuations play a major role and that the statistical equilibrium limit seems to have been reached in a number of instances. DOE

N81-33963# Sandia Labs., Albuquerque, N. Mex.
PLASMA CHANNELS FOR INTENSE ION BEAM TRANSPORT: THEORY
J. R. Freeman, L. Baker, and D. L. Cook 1981 8 p refs Presented at the 4th Intern. Topical Conf. on High-Power Electron and Ion-Beam Res. and Technol., Palaiseau, France, 29 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024916; SAND-81-0477C; CONF-810620-3) Avail: NTIS HC A02/MF A01

Current-carrying plasma channels are proposed for transporting intense ion beams from the diodes to the central target region in reactors. At the gas pressures required for reasonable beam collisional energy loss (10 to 20 torr argon), the Lorentz force produced by the channel current can prevent the expansion and density reduction required for efficient beam propagation. A two-stage current pulse is shown to provide a way for meeting both the channel current and density requirements. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N81-33964# California Univ., Livermore. Lawrence Livermore Lab.

NUCLEAR WASTE REPOSITORY CHARACTERIZATION: A SPATIAL ESTIMATION/IDENTIFICATION APPROACH
J. V. Candy and N. Mao Mar. 1981 8 p refs Presented at the 8th Triennial World Congr.-Intern. Federation of Automatic Control, Hyoto, Japan, 24-28 Aug. 1981
(Contract W-7405-eng-48)
(UCRL-84163-Rev-1; CONF-810815-1-Rev-1) Avail: NTIS HC A02/MF A01

The application of spatial estimation techniques to a groundwater aquifer and geological borehole data are discussed in this report. It investigates the adequacy of these techniques to reliably develop contour maps from various data sets. The practice of spatial estimation is discussed and the estimator is then applied to a groundwater aquifer system and a deep geological formation. It is shown that the various statistical models must first be identified from the data and evaluated before reasonable results can be expected. DOE

N81-33965# Argonne National Lab., Ill.
ARGONNE'S PROGRAM IN HEAVY-ION FUSION
R. L. Martin, R. Arnold, R. Burke, and J. Watson 1980 6 p refs Presented at 11th Intern. Conf. on High Energy Accelerators, Geneva, 7 Jul. 1980
(Contract W-31-109-eng-38)
(DE81-023529; CONF-800740-28) Avail: NTIS HC A02/MF A01

A xenon accelerator which could serve as the driver for an inertial confinement fusion power plan is discussed. The system consists of a Xe source, a 1.5 Mv Dynamitron preaccelerator, independently phased RF cavities as a low beta limac, and Wideroe limac at 12.5 and 25 MHz. The beam is injected at 220 MeV into a circular ring to its space charge limit, transferred to a second ring for multiturn injection after an x-y rotation, extracted, compressed in time duration, transported and focused onto foil targets. DOE

N81-33966# Technical Research Centre of Finland, Helsinki. Nuclear Engineering Lab.
REACTOR PHYSICS OF NATRIUN-COOLED FAST BREEDER REACTORS
Markku Rajamaeki 1980 37 p refs In FINNISH; ENGLISH summary
(VTT-52; ISBN-951-38-1084-4; ISSN-0355-3698) Avail: NTIS HC A03/MF A01

Reactor properties of liquid metal fast breeder reactors and pertinent computational methods with their applications and results are presented. Designs of reactor core and fuel are outlined. Main characteristics and layout of the homogenous and the heterogenous core are described. Reactor safety and the possibility of a hypothetical core descriptive accident is discussed. The influence of the neutron flux on the reactivity of the core is depicted. Differences between LMFBR and light water reactors are emphasized in the reactor description. Author (ESA)

N81-33967# Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
RESEARCH ACTIVITIES IN HIGH ENERGY PHYSICS Annual Report, 1980
1981 101 p refs
Avail: NTIS HC A06/MF A01

Electron scattering experiments are described. Construction and testing of the MEA Accelerator and of the instrumentation in the experimental halls was surveyed. Work on the building of a pion channel and a 180 deg electron scattering set-up was also reviewed. Progress in muon and hadron physics, radio and nuclear chemistry and in theoretical and technical departments is outlined. Author (ESA)

74 OPTICS

Includes light phenomena.

N81-33968*# Virginia Univ., Charlottesville.
INVESTIGATION OF DIRECT INTEGRATED OPTICS MODULATORS Final Report
T. E. Batchman and G. M. McWright Sep. 1981 75 p refs (Grant NsG-1567)
(NASA-CR-164853; UVA/528171EE81/101) Avail: NTIS HC A04/MF A01 CSCL 20F

Direct optical modulation techniques applicable to integrated optical data preprocessors were studied. Emphasis was placed on the analysis and fabrication of a field effect type modulator. A series of computer modeling studies were performed to determine the effects of semiconductor cladding on the fields of propagating waves in planar dielectric waveguides. These studies predicted that changes in the propagation characteristics of waveguides clad with silicon and gallium arsenide could be made large enough to be useful in modulators. These effects are dependent on the complex permittivity and thickness of the cladding. Since the conductivity of the cladding can be changed by the photon generation of hole-electron pairs, incoherent light may be used as the input to modulate a coherent light beam. Waveguides were fabricated and silicon claddings were applied to verify the theoretical predictions. J.M.S.

N81-33969# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz. Research and Development Systems.
ZERO LENGTH INTRASTATION FIBER OPTICS LINKS TEST AND EVALUATION PROGRAM Final Report, Oct. 1979 - Jun. 1980
Charles A. McCaslin, Bernard A. McLaughlin, John Lelivelt, Miodrag Lazarevich, and John Peacock May 1981 103 p
(AD-A103525) Avail: NTIS HC A06/MF A01 CSCL 17/2

This program covers the test and evaluation of then available selected commercial fiber optics (F/O) transmission systems used as interconnect links in a typified Defense Communications System (DCS) transmission node between DCS digital multiplexers and radios. The intent being to evaluate fiber optics utility as interconnect links in a typical DCS Intrastation environment (less than 300 feet) and to evaluate their performance against equivalent conventional metallic interconnects. Results indicate that F/O systems are as equally suitable for intrastation applications as the equivalent metallic wire/cable systems and do have some advantages as high data rate interconnects.
Author (GRA)

N81-33970# Rockwell International Science Center, Thousand Oaks, Calif. Microelectronics Research and Development Center.
NOISE REDUCTION FOR FIBER OPTIC SENSORS Final Report, 14 Mar. 1980 - 14 Jan. 1981
V. Vali and M. Berg Jun. 1981 66 p refs
(Contract N00173-80-C-0108)
(AD-A103481; C80-380/501) Avail: NTIS HC A04/MF A01 CSCL 17/8

This effort addressed several unresolved questions related to noise sources and readout techniques for fiber optic sensors. The tasks were divided into two fundamental areas: (1) an experimental investigation of polarization noise in single mode fibers, and (2) a tradeoff study of readout schemes for the fiber optic gyro. Each of these areas of investigation is discussed. The experimental results of this study confirmed the belief that for any phase sensitive fiber optic sensor a polarization maintaining fiber or a mechanism for creating one must be present. Since most of the mechanical or electro-mechanical techniques for inducing constant polarization in fibers are neither practical or effective for long fibers the answer ultimately lies in developing long lengths of single mode polarization maintaining fibers. Considerable effort should be expended to develop such fibers as they do not now exist in the quantity or lengths required for many applications. Until such fibers are available, engineering efforts for fiber gyros, etc., will show little payoff. GRA

N81-33971# Naval Ocean Systems Center, San Diego, Calif. Advanced Systems Div.
A FIBER OPTIC CABLE COMMUNICATIONS LINK FOR TETHERED REMOTELY CONTROLLED SUBMERSIBLES Research Report, Oct. 1980 - Jan. 1981
M. McCord Mar. 1981 17 p refs
(AD-A103423; NOSC/TD-443) Avail: NTIS HC A02/MF A01 CSCL 09/6

This document presents a concept for a fiber optical cable communication link (FOCL) suitable for tethered, remotely controlled submersibles. FOCL was conceived as a possible electromagnetic interference (EMI) tolerant alternative to the EMI susceptible electromechanical cable communication link of the Mine Neutralization System (MNS) Advanced Developmental Model (ADM). The envisioned FOCL consists of an electro-optical/mechanical cable, a cable handling and storage unit, a pair of optical interface units, and a pair of signal processing units. Functionally, FOCL is capable of transmitting three-phase electrical power and four telemetry signals (two narrowband signals and two wideband television-quality signals) over a composite electro-optical/mechanical cable. The conceived FOCL is inherently EMI tolerant by virtue of its optically isolated interfaces, and thus represents a potential solution to the EMI susceptibility of the MNS. Also, once developed, FOCL will be highly adaptable to many other applications. GRA

N81-33972# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.

ADVANCED SPECTRUM ANALYZER Bimonthly Letter Report, 5 Mar. - 5 May 1981

W. K. Burns 5 May 1981 9 p refs

(Contract N00173-80-C-0474)

(AD-A103791; BMR-4) Avail: NTIS HC A02/MF A01 CSCL 20/6

The bulk of the effort was placed on characterizing lasers which might be used as sources on the spectrum analyzer and in attempting to butt-couple lasers to our devices. We also attempted for the first time to fabricate some geodesic lenses on a different diamond-turning facility located at Pneumo-Precision, Inc. in Keene, New Hampshire, and performed additional systems analyses in an effort to better characterize the spectrum analyzer performance when operating on very short pulses of RF power. The progress in each of these areas together with a discussion of our plans for the next bimonthly report period and a financial statement regarding the program expenditures to this point in the effort is discussed. GRA

N81-33973# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.

ADVANCED SPECTRUM ANALYZER Bimonthly Letter Report, 5 Jan. - 5 Mar. 1981

W. K. Burns 5 Mar. 1981 9 p refs

(Contract N00173-80-C-0474)

(AD-A103790; BMR-3) Avail: NTIS HC A02/MF A01 CSCL 14/2

The objective of this phase of the program is the extension of the operational capability of the IOSA to: (1) a useful linear dynamic range of 40 dB, beginning at a signal-to-noise ratio (SNR) of 6.7 dB, for RF input pulses with durations of 0.4 microsec or longer and (2) a differential signal strength sensitivity of 40 dB for simultaneous long-duration pulsed or CW RF signals separated in frequency by 16 MHz. Efforts during this reporting period covered all major developmental areas of the program with the exception of geodesic lens fabrication and testing. Emphasis was placed upon: (1) investigations of the applicability of GaAlAs diode lasers from three different manufacturers to the optical system of the advanced IOSA; (2) continued efforts toward butt-coupling of General Optronics lasers mounted on our heat sinks to LiNbO3:Ti waveguides; and (3) exploration of techniques to improve the performance of the 5050 photodiode array and its associated readout electronics in order to decrease to system noise level toward the basic noise level of the photosensor chip. Progress in each of these areas will be summarized and the program plan for the next bimonthly period is outlined. GRA

N81-33974# Howard Univ., Washington, D. C. Dept. of Chemistry.

OVERTONE VIBRATIONS OF OH GROUPS IN FUSED SILICA OPTICAL FIBERS

J. Stone and G. E. Walrafen Sep. 1981 55 p refs Prepared in cooperation with Bell Telephone Labs., Holmel, N.J.

(Contract N00014-80-C-0305; NR Proj. 051-733)

(AD-A103901; TR-4) Avail: NTIS HC A04/MF A01 CSCL 07/4

The OH-stretching fundamental, and the first, second, and third OH overtone vibrations have been examined using pure and GeO2 - doped graded index, fused silica optical fibers having OH contents from less than 1ppm to greater than 1,000 ppm. The previously reported component substructure of the fundamental vibrations of fused silica. Several new vibrations were uncovered and assigned. Examinations of deuterated OH samples helped to verify the assignments. The spectral broadening produced by GeO2 was interpreted in terms of a wider range of environments seen by the OH oscillators, compared to pure fused silica. Author (GRA)

N81-33975# Los Alamos Scientific Lab., N. Mex.

SCINTILLATORS FOR FIBER OPTICS: SYSTEM SENSITIVITY AND BANDWIDTH AS A FUNCTION OF FIBER LENGTH

S. S. Lutz, L. A. Franks, J. M. Fluornoy, and P. B. Lyons 1981 9 p refs Presented at the SPIE Intern. Symp., San Diego, Calif., 24-28 Aug. 1981 Prepared in cooperation with EG and G, Inc., Santa Barbara, Calif.

(Contracts W-7405-eng-36; DE-AC08-76NV-01183)

(DE81-025354; LA-UR-81-1945; CONF-810810-9) Avail: NTIS HC A02/MF A01

A time resolved plasma imaging experiment using a scintillator and 100 channels of graded index fiber was successfully tested. Several scintillator systems were developed with emission wavelengths more compatible with fiber optics and with responses times in the nanoseconds and subnanosecond time regions. DOE

N81-33976# Los Alamos Scientific Lab., N. Mex.

RADIATION-INDUCED TRANSIENT ABSORPTION IN OPTICAL FIBERS

L. D. Looner, G. TurquetdeBeauregard, P. B. Lyons, and R. E. Kelly 1981 18 p refs Presented at the 25th Ann. Tech. Symp. SPIE Tech. Programs Comm., San Diego, Calif., 24-28 Aug. 1981

(Contract W-7405-eng-36)

(DE81-028742; LA-UR-81-2135) Avail: NTIS HC A02/MF A01

Transient absorption in optical fibers was studied with emphasis on fast absorption components. Radiation damage was induced with a Febetron 706 electron accelerator modified to deliver an electron pulse width of 1.1 ns. Dye lasers were synchronized to the accelerator to provide a light pulse through the fiber during the radiation pulse. The output light pulse was detected with a biplanar vacuum photodiode. Four scope traces were used on each electron pulse to monitor the Febetron output, the input drive pulse, and two records of the output pulse on two sweep speeds. Detailed data were acquired for times less than 100 hs after irradiation. An insulated enclosure was used to vary fiber temperature from -30 C to +250 C. Several fibers were studied with emphasis on ITT T303 PCS fiber. Data were acquired at 600 and 850 nm. Theoretical modeling of the data is presented. DOE

N81-33977# California Univ., Livermore. Lawrence Livermore Lab.

RADIATION-TO-LIGHT CONVERTERS FOR NUCLEAR ENVIRONMENTS: NEAR INFRARED EMITTERS

F. Roeske, M. D. Rotter, P. M. Calavan, and S. S. Lutz 4 May 1981 9 p refs Presented at SPIE Intern. Symp., San Diego, 24 Aug. 1981

(Contract W-7405-eng-48)

(DE81-023155; UCRL-85604) Avail: NTIS HC A02/MF A01

Initial investigations of two, near infrared emitting semiconducting materials (CdTe and GaAs) are described. Data are presented on the wavelength of emission, linearity, time response, and relative efficiency of these semiconductors. Most data were taken at 77 K because of a dramatic increase in efficiency at this temperature. Measurements show that the intensity vs dose curves are linear over several decades of useful input levels. Measurements indicate that GaAs has an efficiency and time response that promise to be useful in diagnostic systems. DOE

N81-33978# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.

OPTO-ELECTRONICS: APPARATUS AND TECHNOLOGY [OPTRONIK - APPARATER OCH TEKNIK]

Daniel Glansholm Jan. 1980 134 p In SWEDISH

(FOA-C-30183-E) Avail: NTIS HC A07/MF A01

A synthesis of opto-electronics technology is presented emphasizing military applications and associated equipment. In order to describe components and opto-electronic phenomena, a functional expose is given on apparatus that make use of opto-electronics in a fundamental way. The state-of-the-art of opto-electronics is underscored. Special attention is paid to range calculations for a typical class of equipment. Author (ESA)

N81-33979# Leitz (Ernst) G.m.b.H., Wetzlar (West Germany). Ressort Entwicklung.

COMPONENTS FOR AUTOMATED MICROSCOPY Final Report

Hans Determann, Horst Hartmann, Karl-Heinz Schade, and Hans-Werner Stankewitz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 43 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-140; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,05

A number of devices, aiming at automated analysis of microscopic objects as regards their morphometrical parameters or their photometrical values, were developed. These comprise: (1) a device for automatic focusing tuned on maximum contrast; (2) a feedback system for automatic optimization of microscope illumination; and (3) microscope lenses with adjustable pupil distances for usage in the two previous devices. An extensive test program on histological and zytological applications proves the wide application possibilities of the autofocusing device. Author (ESA)

N81-33980# Valvo G.m.b.H., Hamburg (West Germany). Unternehmensbereich Bauelemente.

LINEAR P2CCD IMAGE SENSOR WITH INCREASED IMAGE-ELEMENT PACKING DENSITY AND IMPROVED SPECTRAL RESPONSE Final Report

Manfred Herrmann, Rainer Imjela, and Karl Neumann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 92 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-164; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,30

A monolithic solid state image sensor is described. Four profiled peristaltic charge coupled device (P2CCD) shift registers were used as on-chip readout circuitry. The circuit design of the sensor, the manufacturing process, the off-chip selection circuit, and the signal treatment are presented and discussed. Compared to line sensors with two shift registers, the four register sensor approaches results in a higher image-element packing density and the line is two times smaller. The light sensitivity and the spectral response of the sensor in the blue part of the visible spectrum are improved. Author (ESA)

N81-33981# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Fachbereich Werkstoffe und Bauelemente.

PASSIVE ELECTRO OPTICAL MATERIALS AND APPLICATIONS Final Report

Klaus Diekstall, Anca Gutu-Nelle, Joachim Lauckner, Felix Lutz, Siegfried Mueller, Gerhard Seibold, Hermann Schichl, and Hans Volz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 168 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-166; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33,30

Electro-optical ceramics made of lead/lanthanum/zirconates/titanates (PLZT) can be economically manufactured by coprecipitation of the base materials and by vacuum sintering of the sintering of the green blocks. Magnesium additives reduce by half the operating voltage required to achieve an equal contrast ratio. Transparent electrodes deposited by sputtering tin-indium oxide remain transparent up to 2400 nm. The contrast ratio in the scattering mode amounts typically to 100 : 1 at 500 nm and 5 : 1 at 1000 nm, while in the birefrigence mode it amounts typically to 10,000 : 1 at 800 V/mm, at a thickness of 0.4 mm. Functional blocks were designed to demonstrate and test applications: a laser modular; a light intensity attenuator; welding protection goggles; and numerical displays. The first promising results with sputtered thin films indicate future suitability for displays. Multiple light modulators for opto-electronic nonimpact printing presently appear to be the most important application area. Author (ESA)

N81-33982# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

SPECIAL TOPICS IN OPTICAL PROPAGATION

P. Halley, ed. Jul. 1981 415 p refs In ENGLISH and FRENCH Conf. held at Monterey, Calif., 6-10 Apr. 1981

(AGARD-CP-300; ISBN-92-835-0295-7) Avail: NTIS HC A18/MF A01

The elements of knowledge which are technically utilizable, and the elements of development in the field of propagation and optical devices, which have a direct military application to communication and reconnaissance are assessed. The reconnaissance of sea traffic from surveillance satellites, strategic communications and communications with submerged submarines, which depend on propagation, and instruments, laser sources, and special filters are included. For individual titles, see N81-33983 through N81-34023.

N81-33983# Naval Ocean Systems Center, San Diego, Calif.

OVER-THE-HORIZON OPTICAL SCATTER PROPAGATION IN THE MARINE BOUNDARY LAYER

G. C. Mooradian and M. Geller *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 4 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Measurements of the scattering properties from normal marine atmospheric aerosols for an over-the-horizon (OTH) optical propagation channel were made for two links. The first link involves an overwater range of 63 km with 19 km and 40 km horizons; the second involves an overwater range of 128 km with a 19 km horizon. Pathloss measurements as a function of transmitter-receiver azimuth and elevation angles for a 0.51 micron Ar-ion CW laser, and a 1.06 micron and 0.53 micron frequency doubled pulsed Nd:YAG laser are reported. Examples of atmospheric ducting are shown with an accompanying large increase of signal and severe scintillations. Two theoretical models are presented, one based on particulate single scatter and the other based on particulate multiple scatter. Comparison between models and the experimental results are made. J.M.S.

N81-33984# Tetra Tech, Inc., Pasadena, Calif.

MULTIPLE SCATTER OF COLLIMATED IRRADIANCE

W. H. Wells, J. Harris, and H. C. Lin *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs Sponsored in part by the Navy (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Multiple scattering of incoherent light (or other particles) in an optically thick medium with a plane surface is investigated using the method of spherical harmonics. Techniques that are particularly useful when scattered radiance has a forward peak that generates harmonics of very high degree are described. Convergence of computations hinges mainly on the small number of harmonics in the backscatter and not so much on the large number in the incident and forward scattered light. The method uses annihilation operators to improve the solution by removing eigenfunctions that propagate the wrong way. Backscattered radiance at the surface may be calculated without solving for interior radiance. J.M.S.

N81-33985# Pacific-Sierra Research Corp., Santa Monica, Calif.

GREEN'S FUNCTION CALCULATION OF THE EFFECTS OF THE AIR/WATER INTERFACE ON OPTICAL PROPAGATION

R. F. Lutomirski and D. E. Snead *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 8 p ref (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

A Green's function formulation was developed for the propagation of radiance in forward scattering media. The method is used to compute the underwater downwelling radiance and irradiance distributions from a laser source impinging on the ocean surface from above. Calculating the second moment of

the irradiance generates an analytic expression for the underwater scintillation in terms of the wave curvature statistics at the surface. J.M.S.

N81-33986# Washington Univ., Seattle. Dept. of Electrical Engineering.
MULTIPLE SCATTERING EFFECTS ON OPTICAL PROPAGATION IN TURBULENCE AND PARTICLES
Akira Ishimaru *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The propagation and scattering characteristics of optical beams in fog and clouds are examined. In contrast with the turbulence, the droplet sizes of fog and clouds are comparable to a wavelength and the scattering is spread over wide angles. Therefore, the wave transmission and scattering exhibit different characteristics depending upon whether the particle sizes are smaller or larger than a wavelength. Three solutions and their limitations are discussed. The forward scatter approximation is used for large particles, while the diffusion approximation is used for small particles. The radiative transfer can be used for all sizes. However, solutions are availale only for special wave types and medium geometries. J.M.S.

N81-33987# German Military Geophysical Office, Traben-Trarbach (West Germany).
INVESTIGATIONS FOR THE DEVELOPMENT OF A FORECAST SYSTEM FOR UNDERWATER-VISIBILITY IN THE HELIGOLAND BIGHT
Ekkehard R. Kuesters *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

In the Heligoland Bight, a shallow part of the North Sea, correlations between meteorological/oceanographic parameters and turbidity are investigated. There are two components that influence underwater visibility: inorganic material and plankton. During most of the year a reduction of the visibility is caused by sediment particles stirred up by strong winds. In summer, however, especially in August, plankton can reach such densities that its influence is greater than that of inorganic material. The vertical extension of the layer rich in plankton is limited by salinity stratifications. During calm periods internal tides make the salinity boundary layer oscillate up and down. The drastic reduction in transparency by sediment particles normally lasts until the third day after the end of a storm, then a pronounced improvement can be noticed. J.M.S.

N81-33988# Naval Postgraduate School, Monterey, Calif.
METEOROLOGICAL DESCRIPTIONS FOR OPTICAL PROPERTIES
K. L. Davidson, G. E. Schacher, and C. W. Fairall (BDM Corp., Monterey, Calif.) *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

Observational experiments on turbulent intensities and aerosol distributions in the marine atmospheric boundary layer were performed to relate optical properties to bulk meteorological parameters. Parameters which define the surface fluxes of momentum, heat, and moisture, the processes at the inversion, and the profiles within the intervening convectively mixed layer were examined. Results indicate that optical turbulence (C sub n sq) can be accurately estimated from measured values of wind, temperature, and humidity. A bulk model for estimating optical turbulences was evaluated on the basis of optically determined values with good agreement. Good agreement was observed between extinction values obtained from transmission measurements and those obtained from measured aerosol distributions. However, an existing empirical expression to relate the latter to wind speed and relative humidity appears to be inadequate. J.M.S.

N81-33989# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. fuer Physik der Atmosphaere.
DEPENDENCE OF AIR TO GROUND (LAND AND SEA) VISIBILITY RANGES ON LOW FLIGHT ALTITUDES IN CONJUNCTION WITH METEOROLOGICAL PARAMETERS
H.-E. Hoffmann *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

In outdoor tests the influence of different observation and environmental parameters on the visibility of objects observed from a helicopter was determined. During these tests it was also researched how distances for detection, recognition, and identification change for observations with the naked eye, when these observations are made from different altitudes in the lower atmosphere. In one case it showed up that an increase of the flight altitude by 100 m caused a decrease of the maximum identification range from 2 to 0.8 km, and of the maximum detection range from 15 to 13 km. This might be explained by layers of increased aerosol extinction within the range of temperature inversion or below the cumulus condensation level. J.M.S.

N81-33990# Centre de Recherches de la Compagine Generale d'Electricite, Marcoussis (France).
DETERMINING THE PERFORMANCE OF A COAT SYSTEM IN THE TRACKING PHASE [DETERMINATION DES PERFORMANCES D'UN SYSTEME COAT EN REGIME DE POURSUITE]
G. Roger *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 10 p ref In FRENCH; ENGLISH summary (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The performance of a COAT system the phase tracking is operating is computed. Phase errors are detected by dithering so the system uses two deformable mirrors of any type, one for correction, one for modulation. It is assumed that the phase errors which must be corrected, the characteristics of the mirrors, the noise spectral density of the receiver, and the gain matrix are known. An expression which represents the gain loss due to the phase errors is determined and a vector space of surfaces with an inner product such that the loss appears as the squared norm of a vector in that space is defined. Changing the basis of the vector space permits the shape of the wave front to be expressed as a combination of simple shapes, which may guide the choice of the mirror structure. The minimal loss corresponding to the correcting mirror, then the loss corresponding to the combination of the correcting mirror and the modulating mirror are computed. The gain matrix is introduced and the general loop equation of the complete system is obtained. J.M.S.

N81-33991# Physics Lab. NDRO-TNO, The Hague (Netherlands).
ATMOSPHERIC MEASUREMENTS IN A COASTAL ENVIRONMENT
T. Bakker *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 11 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The results of measurement projects concerning atmospheric limitations for the application of electro-optical equipment are reviewed. Results of simultaneous transmission measurements along close parallel tracks in the visible and the infrared as well as the mm wave (94GHz) region are compared. Long range (5 km) laser transmission measurement results are given. Remote measurement techniques as well as aerosol counters were applied in order to determine the relevant atmospheric characteristics. The measurements were carried out in a coastal environment and on the North Sea. In order to study mutual relationships meteorological measurements were done simultaneously. J.M.S.

N81-33992# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. of Optoelectronics.
MEASUREMENTS OF CLOUD DEPOLARIZATION AND MULTIPLE SCATTERING
Christian Werner and Egmont Wolff *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

A calibrated lidar system is used to obtain values of backscatter coefficients, depolarization rations, and multiple

scattering effects. Measurements of cloud polarization and multiple scattering effects on different cloud types are reported. An anisotropy of the depolarization with the aximuth angle was determined. This anisotropy depends on the size of the cloud droplets. J.M.S.

N81-33993# Laboratoire d'Optique Appliquee, Palaiseau (France).

APPLICATION OF LASERS TO THE MEASUREMENT OF ATMOSPHERIC GASES FROM A A DISTANCE: THE USE OF RESONANT RAMAN DIFFUSION [APPLICATION DES LASERS A LA MESURE A DISTANCE DES GAZ ATMOSPHERIQUES: UTILISATION DE LA DIFFUSION RAMAN RESONNANTE]

J. C. Pourny and Hassab ElNabySalah *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 11 p refs In FRENCH (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The use of lasers for remotely detecting gaseous compounds in the atmospheric was developed in different lidar techniques involving several types of interactions of monochromatic laser light with atmospheric molecules. Measurement by absorption, particularly in the infrared, permits sensitivities on the order of ppb, on a measurement path of some hundreds of meters. Differential absorption, which is less sensitive, affords the possibility of exploring in all directions with a distance resolution. Lidar measurement based on Raman diffusion permits sounding numerous molecular constituents with a single laser ray. Its use is always limited to highly concentrated compounds. Tunable lasers are beneficial in the case of resonance where the Raman diffusion section increases strongly. Cross sections for NO2, SO2, and O3 are examined. It is shown that the method is of interest in detecting dispersed constituents in clouds. Transl. by A.R.H.

N81-33994# Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.

MULTIWAVELENGTH EXTINCTION AND INDEX FLUCTUATION MEASUREMENTS

E. C. Crittenden, Jr., E. A. Milne, A. W. Cooper, G. W. Rodeback, and S. H. Kalmbach *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 7 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The effects of aerosols and turbulence on optical propagation through the atmosphere were measured with double ended systems. Path lengths up to 15 km were utilized. For horizontal paths, the length is limited by the curvature of the Earth. Both band-filtered grey body and laser sources are used for extinction measurements at 16 wavelengths from 0.4 to 10 micrometers. A chopped beam is used with synchronous detection, to improve signal-to-noise ratio. Detection and digitization of the received signal are triggered by means of a small-divergence pulsed pilot laser beam, located at the center of the main beam. The effects of turbulence on the index of refraction were determined using scintilation and optical transfer function. Equipment was developed to make optical transfer function measurements with a pulsed source on an aircraft during of fly-over. A.R.H.

N81-33995# Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.

MEASUREMENTS OF OPTICAL ATMOSPHERIC QUANTITIES IN EUROPE AND THEIR APPLICATION TO MODELING VISIBLE SPECTRUM TRANSMITTANCE

Richard W. Johnson and Wayne S. Hering *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p refs (For primary document see N81-33982 24-74)

(Contract F19628-78-C-0200)

Avail: NTIS HC A18/MF A01

A series of data flights to obtain simultaneous optical and meteorological measurements betwen ground levels and an altitude of 6 km was conducted during each of five separate two month periods selected to be representative of each of the four temporal seasons. Illustrative data representing altitude profiles of visible spectrum scattering characteristics are presented, as are the simultaneous measurements of ambient and dewpoint temperature. Several contemporaneous sets of multi-spectral directional volume scattering function measurements at scattering angles of 30 and 150 degrees are included. The use of these data as a basic for the development of a technique for estimating atmospheric path radiance and contrast transmittance is discussed. A computer model for the estimation of these atmospheric properties that is relatively fast and easy to apply is described with examples of its performance. The model predicts the directional path radiance and contrast transmittance of any slant atmospheric path as a function of wavelength. A.R.H.

N81-33996# Naval Ocean Systems Center, San Diego, Calif.

COMPARISON OF UNDERWATER RADIANCE MEASUREMENTS WITH VARIOUS ANALYTICAL TREATMENTS OF THE RADIATIVE TRANSFER EQUATIONS

R. Anderson and L. Stotts *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 16 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

In situ experimental data are presented on the off-axis radiance produced by a pulsed underwater laser operating at a wavelength of 520 nanometers. Path lengths in homogeneous seawater range up to 50 meters with separations of up to more than 6 meters from the path. Absorption and scattering lengths in the water are about 6 and 4 meters, respectively. These results are compared with the predictions provided by popular models derived from radiative energy theory. Limitations are clearly shown on the accuracy of the radiance predicted by these models. Author

N81-33997# GTE Sylvania, Inc., Mountain View, Calif. Systems Group.

DOWNLINK LASER CLOUD PROPAGATION EXPERIMENT

G. R. Hostetter and P. J. Titterton *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 10 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

An experiment was designed to obtain the first measurements of laser pulse stretching resulting from downward vertical propagation through a cloud. For the nonuniform clouds that were present over Kauai, pulse stretching was found to be less than was expected from propagation thoery. The clouds were characterized by an aircraft-borne Knollenberg particle counter and by attenuation of moonlight passing through the cloud layer. For cloud geometric thickness of 4,000 to 8,600 feet and optical thickness of 19 to 86, the received pulsewidths range from 1 to 7 microseconds. These received pulsewidths were from 0.05 to 0.2 of the theoretically predicted values. Typically, to received pulse were composed of a fast and a slow component, indicating at least two different propagation modes through the clouds. The widths of the slow components were approximately equal to the theoretical values predicted for the entire pulse. A.R.H.

N81-33998# York Univ., Downsview (Ontario). Dept. of Physics.

LABORATORY MEASUREMENTS OF LIGHT PROPAGATION IN TURBID MEDIA

Allan I. Carswell *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The propagation and scattering of laser beams in turbid media were investigated experimentally. Water droplet clouds and liquid water suspensions of scatterers were studied. A major area of interest was the use of polarization information to measure multiple scattering. In the forward direction the effects of multiple scattering on the extinction coefficient and on the beam shape were measured. It was found that the incident beam characteristics (width, polarization, coherence) are strongly preserved in the forward direction even at extinction coefficients as high as 5 m/1. In the backward direction, measurements of cloud reflectance were made. The polarization of the reflected signal is found to be spatially anisotropic and to depend strongly on the size parameter of the scatterers. Applications of the findings for diagnostics of turbid situations in the atmosphere are discussed. A.R.H.

N81-33999*# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.

REMOTE SENSING OF THE DIFFUSE ATTENUATION

COEFFICIENT OF OCEAN WATER

R. W. Austin *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)

(Contracts NAS5-26249; N00014-78-C-0566; NOAA-04-6-158-44033; NOAA-NA80AA-D-00007)

Avail: NTIS HC A18/MF A01 CSCL 20F

A technique was devised which uses remotely sensed spectral radiances from the sea to assess the optical diffuse attenuation coefficient, K (lambda) of near-surface ocean water. With spectral image data from a sensor such as the coastal zone color scanner (CZCS) carried on NIMBUS-7, it is possible to rapidly compute the K (lambda) fields for large ocean areas and obtain K 'images' which show synoptic, spatial distribution of this attenuation coefficient. The technique utilizes a relationship that has been determined between the value of K and the ratio of the upwelling radiances leaving the sea surface at two wavelengths. The relationship was developed to provide an algorithm for inferring K from the radiance images obtained by the CZCS, thus the wavelengths were selected from those used by this sensor, viz., 443, 520, 550 and 670 nm. The majority of the radiance arriving at the spacecraft is the result of scattering in the atmospheric and is unrelated to the radiance signal generated by the water. A necessary step in the processing of the data received by the sensor is, therefore, the effective removal of these atmospheric path radiance signals before the K algorithm is applied. Examples of the efficacy of these removal techniques are given together with examples of the spatial distributions of K in several ocean areas. A.R.H.

N81-34000# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics. Div.

RECENT AUROROL AND AIRGLOW MEASUREMENTS IN THE INFRARED

A. T. Stair, Jr., R. Nadile, J. C. Ulwick, K. D. Baker, and D. J. Baker *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs Prepared in cooperation with Utah State Univ., Logan (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Specialized cryogenic infrared instrumentation was developed for measuring the aurora, airglow, and upper atmospheric emissions for aircraft, rockets, and satellite platforms. Starting in 1972, a series of some 30 rockets have been launched from Poker Flat, Alaska. The highlights, of these measurements, the first auroral enhancements at wavelengths longer than 2 micrometers and the first upper atmospheric radiation observed from 70 to 150 km in the wavelength region 2 to 2 micrometers are reviewed. In addition, more recent data obtained by a rocketborne cryogenic telescoped spectrometer which scanned the earthlimb and observed infrared (1.5 to 17 micrometers) emissions from 20 km to 200 km tangent altitudes are discussed. A.R.H.

N81-34001# Air Force Geophysics Lab., Hanscom AFB, Mass.

BACKGROUND MEASUREMENTS FROM A BALLOON-BORNE STARING SENSOR

R. E. Murphy, F. H. Cook, and B. K. Yap (Yap Analytics, Inc., Lexington, Mass.) *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 11 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Several hours of data were gathered on three successful data flights conducted as part of the balloon altitude mosaic measurements (BAMM) program which was designed to collect spectral, spatial, and temporal statistics on the infrared Earth/atmospheric backgrounds. Two of these flights collected data on a wide range of infrared backgrounds characteristics of the Southwestern United States. A third mission provided statistics of the Gulf Coast region as well as solar specular reflections off land, water, and clouds. Measurements were made with a two-color SWIR radiometer and with a Michelson interferometer spectrometer covering the 2.5 to 5.5 micron region from float altitudes of 70,000 to 100,000 ft. Both instruments were spatially co-aligned such that their 4x4 mosaic focal planes projected over-lapping footprints on the ground simultaneously. Data collected on these flights were reduced and relevant statistics were compiled. Samples of the data and results are presented. A.R.H.

N81-34002# Nice Univ. (France). Dept. d'Astrophysique.

OPTICAL C SUB N SQ REMOTE SENSING IN THE UPPER ATMOSPHERIC BY MULTIDIMENSIONAL ANALYSIS OF STELLAR SCINTILLATION

Jean Vernin and Max Azouit *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Multidimensional statistical analysis of stellar scintialltion, the motion of the various atmospheric turbulent layers can be determined both in magnitude and direction, in addition to their turbulent strength (as measured by square (sub n or square C sub to) as a function of altitude. A system which consists of a very light-sensitive image receiver (television camera), followed by a specialized numerical computer (two-dimensional correlator) which utilizes in real time the spatial distribution of the irradiance of a large telescope entrance pupil was developed. This apparatus allows identification of fast temporal variations of the vertical profiles of turbulence strength, using sounding only 10 sec apart. By tracking the double star gamma Virginis, a vertical resolution of about 1.7 km was achieved. Temporal evolution of the reflective index at a given altitude shows that the turbulence remains for several hours but it concentrates in small patches of a few kilometers length. A statistical study of these variations shows that it is possible to modelize the intermittency of the atmospheric turbulence by a this lag power law such as tau to the 0.31 power. A.R.H.

N81-34003# Visidyne, Inc., Burlington, Mass.

INFRARED RADIANCE MODEL OF THE UPPER ATMOSPHERE

T. C. Degges and H. J. P. Smith *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 14 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

A physical model to predict infrared emission was implemented in a computer program that computes infrared radiances for an Earth's limb viewing geometry. The nominal spectral region covered lies between 2.5 and 25 micrometers and emphasis is placed on radiation originating at altitudes between 50 and 300 km. The basic result from the model is the calculation of the populations of vibrational states of the important infrared emitters such as carbon dioxide, water vapor, ozone and nitric oxide. In the troposphere and lower stratosphere, molecular collisions are rapid enough to maintain vibrational populations in kinetic equilibrium. At higher altitudes, radiative de-excitation may be faster than collisional or radiative excitation, and a nonequilibrium vibrational population results. The model uses collisional excitation and de-excitation rates obtained from published data when possible and balances collisional processes with absorption and emission of infrared radiation. The equations of radiative transfer are solved at each level to include absorption of radiation from the Earth's surface, all other atmospheric levels and the Sun. R.C.T.

N81-34004# Atmospheric Radiation Consultants, Action, Mass.

MINIMUM DETECTABLE QUANTITIES OF TRACE GASES USING HIGH RESOLUTION SPECTROSCOPY

A. S. Zachor, B. Bartchi (Utah State Univ., Logan), and F. P. DelGreco (AFGL) *In* AGARD Spec. Topics in Opt. Progagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)

(Contract F19628-77-C-0203)

Avail: NTIS HC A18/MF A01

Studies that define the capability of a Fourier spectrometer (FTS) system to remotely detect and characterize particular gaseous emissions by ground-level stationary sources are summarized. The principal result was a tabulation of predicted minimum detectable quantities (MDQ's) for 14 trace gases including DF, HF and N2O. The detectable (observable) quantity of the target gas was essentially the product of the molecular column thickness of the gas in the line of sight and the Planck spectral radiance difference between the target gas and background averaged over the detection band. The MDQ's are the values of this quantity which correspond to approximately 95 percent probability of detection and one percent probability of false detection. Although derived for a particular baseline system and measurement geometry, the results can be scaled to other

conditions. The baseline FTS systems modelled in the studies employ mosaic focal planes together with optical designs or data processing techniques that perform background subtraction to obtain the target background spectral radiance contrast. Detection and quantification of the target gases are based on the degree of correlation of the observed target spectral contrast with predicted target spectral contrast signatures. R.C.T.

N81-34005# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
LINE-OF-SIGHT OPTICAL COMMUNICATION THROUGH LOW-VISIBILITY WEATHER
Jeffrey H. Shapiro *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)
(Grant NSF ENG-78-78216)
Avail: NTIS HC A18/MF A01

The multiple forward scatter propagation model for a line of sight optical link operating in low visibility weather is summarized. Digital communication performance for diffraction limited and wide field of view receivers are compared. It is shown that background light suppression is the key to extended link operability in the daytime. Three techniques for achieving this suppression are: use of a wide angle narrowband optical filter at the receiver; operation at mid ultraviolet wavelength; and use of adaptive phase compensation at the receiver. The promise and drawbacks of these approaches are briefly discussed. R.C.T.

N81-34006# Naval Ocean Systems Center, San Diego, Calif.
MERCURIC BROMIDE DISSOCATION LASERS
E. Schimitschek *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 11 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The principal features of HgBr2/HgBr dissociation lasers are reviewed. Particular attention is given to their performance status and potential applications for underwater communication systems. R.C.T.

N81-34007# General Electric Co., Philadelphia, Pa.
COPPER VAPOR LASERS: A REVIEW
T. W. Karras *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

Typical operation for two discharge configurations were investigated. Emphasis was placed on an immature transverse discharge mode and a more developed longitudinal discharge mode. Both were demonstrated at average powers exceeding 50 watts. Master oscillator power amplifier operation was used to extend the power of nominal 15 watt modules to over 100 watts. This device also showed great flexibility in its various output parameters. Repetition rate was varied from a single pulse to over 100 kilohertz. Pulse width was changed from 5 to 185 nanoseconds. Its volume was greatly increased while maintaining constant specific output. R.C.T.

N81-34008# General Electric Co., Schenectady, N. Y. Corporate Research and Development Div.
RECENT DEVELOPMENT OF HIGH-POWER VISIBLE LASER SOURCES EMPLOYING SOLID-STATE SLAB LASERS AND NONLINEAR HARMONIC CONVERSION TECHNIQUES
Yung S. Liu, W. B. Jones, and J. P. Chernoch *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 8 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

Developments of high power solid state slab laser technology in both Yd:YAG and Nd:glass are reported. High power nonlinear frequency conversion, employing second harmonic generation in various nonlinear crystals is discussed. Nonlinear phase matching properties critical to efficient frequency conversion in LiIO3, LiNbO3, CDA, KDP, and recently developed KTP (KTiOPO4) are presented. Efficient frequency conversion in the average power range exceeding 10 W imposes severe constraints in both fundamental beam properties and the nonlinear processes in various media. R.C.T.

N81-34009# Naval Research Lab., Washington, D. C.
DOWN-CONVERSION OF RARE GAS HALIDE LASERS FOR BLUE-GREEN APPLICATIONS
R. Burnham, N. Djeu, and B. L. Wexler *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The down conversion of rare gas lasers to the blue-green region was investigated with respect to its scalability and efficiency for applications in blue-green communications systems. Attention was also given to progress in Raman conversion of the XeCl laser output in atomic and molecular media. R.C.T.

N81-34010# Lockheed Missiles and Space Co., Palo Alto, Calif.
NARROW BANDPASS LARGE FIELD OF VIEW OPTICAL FILTERS
William J. Rosenberg and Alan M. Title *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p refs (For primary document see N81-33982 24-74)
(Contract N00014-78-C-0526)
Avail: NTIS HC A18/MF A01

The types and capabilities of birefringent filters are reviewed. The general operating principles of Lyot (perfect polarizers), partial polarizing, and Solc (no internal polarizers) filters are introduced. Appropriate techniques for tuning each filter type are presented. Field of view of birefringent filters is discussed and is compared to Fabry-Perot and interference filters. The transmission and throughput advantage of birefringent filters are shown. The state of the art in practical filters is also reviewed. R.C.T.

N81-34011# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
OPTICAL RECEIVERS FOR UNDERWATER COMMUNICATION
John E. Jackson, Gary M. Lee, and Charles M. Ciany *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 16 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The tradeoffs which must be considered to develop an optimum overall receiver design are discussed. The available choices for a receiver filter are presented and an overall receiver configuration is developed. R.C.T.

N81-34012# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).
OPTICAL FIBER COMMUNICATION AT DIFFERENT TRANSMISSION WAVELENGTHS
K. Hess and H. Haupt *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 7 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The development of 34 Mbit/s optical transmission systems operated at 850 nm and 1200 nm and using graded index multimode fibers are reported and compared. The results of a field trial are presented which illustrate that fiber optic transmission is well suited for real applications. R.C.T.

N81-34013# Hughes Research Labs., Malibu, Calif.
NONLINEAR ADAPTIVE OPTICS
Concetto R. Giuliano *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 13 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

A brief history of the activity in the field of nonlinear optical phase conjugation is presented. The principle for utilizing a nonlinear conjugation in adaptive optics is also discussed. Several examples of potential applications for optical phase conjugation are given. R.C.T.

N81-34014# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
PHASE CONJUGATION AND DEGENERATE FOUR WAVE MIXING IN PHOTOREFRACTIVE Bi12SiO20 CRYSTAL
J. P. Huignard and J. P. Herriau *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

Generation of phase conjugate wavefronts by using real time

holography and degenerate four wave mixing in Bi12SiO20 crystals (BSO) is described. Removal of phase distortions by allowing the time reversed phase conjugate wavefront to travel back through the phase disturbing medium is demonstrated. The spatial frequency dependence of wavefront reflectivity is considered. The use of BSO for real time interferometry is described. Degenerate four wave mixing in BSO crystals with a pulsed Nd YAG laser is demonstrated. Applications of the crystal for coherent image processing, optical computing high speed adaptive optics, hand coherent optical processing are considered. J.D.H.

N81-34015# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy).

THEORY OF NONLINEAR PROPAGATION IN MULTIMODE OPTICAL FIBERS

B. Crosignani, P. DiPorto, and C. H. Papas (California Inst. of Technology, Pasadena) *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

A set of equations which describes pulse propagation in multimode optical fibers in the presence of an intensity dependent refractive index is derived by taking advantage of the coupled mode theory usually employed for describing the influence of fiber imperfections on linear propagation. The role of the waveguide structure in terms of the propagation constants and the spatial configurations of the propagating modes is considered. The conditions under which envelope soliton transmission in the presence of many modes taken place are discussed. The way in which these conditions are modified by the possible presence of carrier fluctuations is considered. J.D.H.

N81-34016# City Coll. of the City Univ. of New York. Dept. of Physics.

THEORY OF NONLINEAR PULSE PROPAGATION IN INHOMOGENEOUS DISPERSIVE MEDIA: APPLICATION TO OPTICAL WAVEGUIDES

N. Tzoar, B. Bendow (RADC, Hanscom AFB, Mass.), and P. D. Gianino (RADC, Hanscom AFB, Mass.) *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 6 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

Nonlinear pulse propagation in longitudinally uniform and nonuniform optical waveguides is analyzed. The approximate analysis employed takes account of various physical effects associated with transverse confinement, dispersion and nonlinearity. It is concluded that both bright and dark solitons may be supported in typical fiberguides under a variety of conditions. This is in marked contrast to the unbounded medium case, where bright silitons exist only under conditions of anomolous dispersion. In the presence of weak longitudinal inhomogeneity, solitons continue to propagate without a change of shape, but their group velocity becomes time dependent. J.D.H.

N81-34017# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.

HOW TO TAP A FIBER OPTIC LINK AND ELUDE DETECTION: WHAT'S NEW IN QUANTUM COMMUNICATION

Jeffrey H. Shapiro *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 5 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The conditional Poisson process statistical model for direct detection, from which the signal plus additive white Gaussian noise statistical models for heterodyne and homodyne detection may be derived is examined. The relationship between these results and recently derived quantum mechanical photodetection formulas is reviewed. It is shown that the two coincide only when the radiation field incident on the detector is in a Glauber coherent state or a random mixture of such states. The two photon coherent states, which are not of this class, are described. They have novel quantum noise characteristics that permit noise reduction to be realized in homodyne detection. In particular, use of two photon coherent state light makes possible high signal to noise ratio detection from a directional coupler that is very weakly linked to an information bearing optical waveguide. Accordingly, a low loss waveguide tap may permit an unauthorized party to obtain information from an optical data bus in a virtually undetectable manner. This result as well as other mysteries and applications of two photon coherent states are explained. J.D.H.

N81-34018# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).

USE OF A REMOTELY CONTROLLED INTEGRATED DIRECTIONAL COUPLER SWITCH IN AN OPTICAL FIBER LINK

P. Papuchon, C. Puech, and A. Schnapper *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 9 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The observation of optical bistability with bulk or integrated modulators or switches, and without a Fabry Perot cavity, is demonstrated. In their output light intensity versus incident light intensity behavior, such devices exhibit hysteresis and can be used as optical limiters, pulse shapers, optical transistors, and bistable switches. The remote control of a bistable directional coupler switch is described. It is shown that the output light from the directional coupler can be switched from one channel to the other via switching informations contained in the incident light itself. J.D.H.

N81-34019# Consiglio Nazionale delle Ricerche, Florence (Italy). Inst. of Ricerca sulle onde Elettromagnetiche.

RESOLVING POWER EVALUATION OF OPTICAL ADAPTIVE SYSTEMS THROUGH THE ATMOSPHERE

Anna Consortini *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 4 p refs (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

The resolving power of coherent optical adaptive systems in the turbulent atmosphere is evaluated. General formulas are given for two systems which produce different kinds of partial corrections of phase and amplitude fluctuations. Numerical results are presented in the case of a modified Karman model. It is concluded that even a partial correction can allow one to overcome the limit of the aperture diameter imposed by the turbulence. J.D.H.

N81-34020# Optical Sciences Co., Placentia, Calif.

ANISOPLANATISM IN ADAPTIVE OPTICS

David L. Fried *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p (For primary document see N81-33982 24-74) (Contract F30602-80-C-0305)

Avail: NTIS HC A18/MF A01

The consequences for an adaptive optics system of the fact that the turbulence induced wavefront distortion for two propagation paths with slightly different propagation directions can be significantly different is examined. The results are presented in terms of the average optical transfer function of a compensated imaging system, and in terms of the average antenna gain of an adaptive optics laser transmitter. Each is expressed as a function of the angular separation between the propagation path along which the reference signal arrives, and the propagation path along which the adaptive optics system is to provide performance. A performance reduction factor representing an asymptotic limit for very high spatial frequencies and for very large transmitter diameters is presented. Numerical results are presented. J.D.H.

N81-34021# Rome Air Development Center, Griffiss AFB, N.Y.

REDUCTION OF ANISOPLANATIC ERRORS

Donald W. Hanson and Nathan Schwartz (Syracuse Univ., N.Y.) *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 10 p (For primary document see N81-33982 24-74)

Avail: NTIS HC A18/MF A01

An optimum linear estimator for the phase at the point ahead angle is developed for the case where the optical line of sight slews through the turbulent atmosphere faster than the turbulence is transported by the ambient winds. Difficulties encountered when using the standard approach to optimum linear estimation are discussed. The optimum linear estimate is developed in terms of the structure and hyperstructure functions, rather than the correlation function, since the correlation function for the phase aberrations is difficult to observe. The relaxation in station keeping requirements which can be achieved through

the use of the optimum linear estimator is derived and found to be on the order of 15%. Author

N81-34022# Arizona Univ., Tucson. Optical Sciences Center.
PHASE MEASUREMENT SYSTEMS FOR ADAPTIVE OPTICS
James C. Wyant and Chris L. Koliopoulos *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 12 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

Sensors that measure the wavefront directly and slope measurement sensors are described and compared. Both self referencing and nonself referencing wavefront sensors are discussed and interferometric and geometric slope sensors are compared. The conclusion is reached that of the phase measurement systems studied to the lateral shear interferometer and the nutating Hartmann sensor are of the most general use due to their high efficiency and simplicity. J.D.H.

N81-34023# Itek Corp., Lexington, Mass. Optical Systems.
ADAPTIVE OPTICAL SYSTEMS USING DISCRETE COMPONENTS
John W. Hardy *In* AGARD Spec. Topics in Opt. Propagation Jul. 1981 14 p refs (For primary document see N81-33982 24-74)
Avail: NTIS HC A18/MF A01

The state of development of adaptive optical systems in which the major functions of wavefront sensing, computation, and wavefront correction are performed by discrete components is discussed. The operating principles and performance of the most important adaptive optical devices developed during the last few years are described, including wavefront sensors, detector arrays, electronic data processors, and deformable mirrors. Typical system configurations for compensated imaging and laser beam control are described. Limitations of discrete technology at the device and system level are reviewed. The directions in which adaptive optical systems may evolve are assessed. J.D.H.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N81-34024# JAYCOR, Alexandria, Va.
PRELIMINARY EXPERIMENTAL DESIGN AND THEORETICAL INVESTIGATION OF A PLASMA IMPLOSION DRIVEN MASS ACCELERATOR Final Report
D. A. Tidman and S. A. Goldstein 1981 97 p refs
(Contract DAAK10-80-C-0267)
(AD-A103155; JAYCOR-J207-81-008) Avail: NTIS HC A05/MF A01 CSCL 20/9

The basic idea that motivated this research effort is the prospect that a series of time z-pinch plasma implosions could be used to sequentially propel a projectile to high velocities. Such a process would provide a new type of electrically driven gun with the potential for achieving projectile velocities well above those attainable by chemical guns. The concept in its earliest form appears to have the attractive feature of being potentially rep-ratable. The current flows axially along sections of the accelerator instead of perpendicular to the projectile path as in a rail gun, i.e., plasma pressure propels the projectile, not the jxB force. The primary objective of this research was to design a test module which, if built, could be used to investigate the effectiveness of such z-pinch implosions for projectile propulsion. Other objectives were to examine background experimental information on z-pinch implosions and to explore a range of parameters using a lumped-parameter computer model for the implosions and their driving circuits. GRA

N81-34025# California Univ., Livermore. Lawrence Livermore Lab.
CONFIGURING THE THERMOCHEMICAL HYDROGEN SULFURIC ACID PROCESS STEP FOR THE TANDEM MIRROR REACTOR
T. R. Galloway 1 May 1981 8 p refs Presented at the IECEC Conf., Atlanta, 9-14 Aug. 1981
(Contract W-7405-eng-48)
(DE81-024711; CONF-810812-24; UCRL-85287) Avail: NTIS HC A02/MF A01

The sulfuric acid step was identified as the critical part of the thermochemical cycle in dictating the thermal demands and temperature requirements of the heat source. The general atomic sulfur-iodine cycle was coupled to a tandem mirror. The sulfuric acid decomposition process step was focused on specifically since this step can use the high efficiency electrical power of the direct converter together with the other thermal-produced electricity to Joule-heat a noncatalytic SO3 decomposer to approximately 1250 K. The blanket temperature was lowered to about 900 K, greatly alleviating materials problems, the level of technology required safety problems, and costs. A moderate degree of heat was integrated to keep the cycle efficiency around 48%, but the number of heat exchangers was limited in order to keep hydrogen production costs within reasonable bounds. DOE

N81-34026# Argonne National Lab., Ill.
SAFETY OF SUPERCONDUCTING MAGNETS FOR FUSION: THERMAL ANALYSIS OF LARGE CRYOSTABLE MAGNETS
L. R. Turner 1980 6 p refs Presented at the Applied Superconductivity Conf., Santa Fe, N. Mex., 29 Sep. - 2 Oct. 1980 Sponsored in part by EG and G, Idaho, Inc.
(Contract W-31-109-eng-38; DE-AC07-76ID-01570)
(DE81-023886; CONF-800980-41) Avail: NTIS HC A02/MF A01

A thermal analysis program was developed to study the response of a cryostable fusion magnet to abnormal conditions such as a localized heat input, overcurrent, or uncooled length of conductor. It performs a heat balance on each element. Variation of parameters with temperature, pressure, and magnetic field are incorporated. The program is applied to a conductor with magnetic field variation along its length, carrying a high current as might occur in one toroidal field coil when a neighboring coil discharges rapidly. It is found that a stable normal region can develop, with possibly serious consequences. DOE

N81-34027# Mississippi State Univ., Mississippi State. MHD Energy Center.
DIAGNOSTIC INSTRUMENTATION FOR THE UNITED STATES MAGNETOHYDRODYNAMIC/HEAT RECOVERY SEED RECOVERY DEVELOPMENT PROGRAM
David L. Murphree 1981 79 p refs Presented at the MHD/HRSR Scientists and Engr. of the People's Republic of China, 10-31 Jul. 1981
(Contract DE-AC02-80ET-15601)
(DE81-029944; DOE/ET-15601/T4) Avail: NTIS HC A05/MF A01

The diagnostic development program in direct support of the major magnetohydrodynamic/heat recovery seed recovery test facilities is described. These optical diagnostic systems are designed to characterize the internal operating environment of the MHD/HRSR components through non-intrusive, real-time, on-line analysis. The present stage of development of each instrument is discussed. A performance evaluation of these packaged, microprocessor-controlled, optical diagnostic systems is presented in relation to their field-operation. DOE

N81-34028# General Atomic Co., San Diego, Calif.
SUPERFLUID HELIUM BATH COOLING OF A TOKAMAK REACTOR TOROIDAL FIELD COIL SYSTEM
Y. H. Hsu, J. Purcell, and J. Alcorn Jul. 1981 10 p refs
(Contract DE-AT03-76ET-51011)
(DE81-028341; GA-A-16422) Avail: NTIS HC A02/MF A01

A conceptual design of a FED reactor compatible toroidal field (TF) coil system employing NbTi alloy conductor and superfluid helium bath cooling is discussed. In order to achieve 11 tesla, NbTi alloy conductor must operate at a temperature below 4.2 K. After a year of comparative analytical and experimental studies, General Atomic has concluded that He2 (superfluid) operation may be preferable to subatmospheric, subcooled He1 conditions. Some of the features of this system are described. DOE

N81-34029# Texas Univ., Austin.
THEORETICAL ASPECTS OF THE NONLINEAR INTERACTION OF DRIFT-TYPE INSTABILITIES IN A PLASMA Ph.D. Thesis
Paul Terry Jul. 1981 177 p refs
(Contract DE-AC05-76ET-53036)
(DE81-028507; DOE/ET-53036/30) Avail: NTIS HC A09/MF A01

Of central importance is consideration of the random phase approximation and its role and validity in plasma turbulence theories. Linear theory is considered to find the criteria for marginal stability of the toroidal ion temperature gradient drift mode. Analytic criteria for the onset of instability giving the dependence on wavenumber, magnetic curvature, and temperature gradient are derived from the drift kinetic equation with the grad-B and curvature drift resonances retained. DOE

N81-34030# Argonne National Lab., Ill. Fusion Power Program.
ARGONNE PLASMA ENGINEERING EXPERIMENT (APEX) TOKAMAK
J. H. Norem, L. J. Balka, E. E. Kulovitz, S. R. Magill, D. G. McGhee, A. Moretti, and W. F. Praeg Mar. 1981 45 p refs
(Contract W-31-109-eng-38)
(DE81-028479; ANL/FPP/TM-145) Avail: NTIS HC A03/MF A01

A Tokamak designed to provide hot plasmas for reactor-relevant experiments with RF heating (current drive) and plasma wall experiments, principally in situ low-Z wall coating and maintenance is described. The device, sized to produce energetic plasmas at minimum cost, is small (R = 51 cm, r = 15 cm) but capable of high currents (100 KA) and long pulse durations (100 ms). A design using an iron central core with no return legs, pure tension tapewound toroidal field coils, digital radial position control, and UHV vacuum technology was used. Diagnostics included monochrometers, X-ray detectors, and a microwave interferometer and radiometer for density and temperature measurements. Stable 100 ms shots were produced with electron temperature in the range 500 to 1000 ev. Initial results included studies of thermal desorption and recoating of wall materials. DOE

N81-34031# Westinghouse Electric Corp., East Pittsburgh, Pa. Fusion Power Systems Dept.
CONCEPTUAL DESIGN OF A COMMERCIAL TOKAMAK HYBRID REACTOR (CTHR) Final Report
Dec. 1980 286 p refs
(Contract DE-AC02-77ET-52043)
(DE81-028375; WFPS-TMS-80-012) Avail: NTIS HC A13/MF A01

This design was developed as a first generation commercial plant for the production of fissile fuel to support a significant number of client light water reactor (LWR) plants. The study was carried out in sufficient depth of indicate no insurmountable technical problems exist, assuming the physics of the fusion driver is verified, and has provided a basis for deriving cost estimates of the hybrid plant as well as estimates of the hybrid/LWR symbiotic system busbar electricity costs. This energy system has the potential to be optimized such that the net cost of electricity becomes competitive with conventional LWR plants as the price of U308 exceeds $100 per pound. DOE

N81-34032# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
TOKAMAK RESEARCH ON VERSATOR 2 Final Report, 1 Oct. 1978 - 30 Jun. 1980
1980 51 p refs
(Contract DE-AS02-78ET-53050)
(DE81-029031; DOE/ER-53050/1) Avail: NTIS HC A04/MF A01

The detailed physical processes involved in RF heating of a Tokamak plasma were studied. Equilibrium and diagnostic studies are also reported. DOE

N81-34033# Wisconsin Univ., Madison.
INVESTIGATION OF AUXILIARY HEATING IN TANDEM MIRRORS AND TOKAMAKS AND BARRIER CELL PUMPING Annual Progress Report, 1 Oct. 1980 - 31 Dec 1981
G. A. Emmert and J. Scharer Jun. 1981 24 p refs
(Contract DE-AC02-79ET-53083)
(DE81-026777; DOE/ET-53083/3) Avail: NTIS HC A02/MF A01

The research focused on physics questions concerned with ECRH heating in tandem mirror plugs, pumping of tandem mirror thermal barriers by drift orbits, ICRH heating in Tokamaks, and bunble divertors. It is concluded that drift-orbit pumping of thermal barriers is not feasible because the azimuthal E Vector X B Vector drift limits the excursion of trapped ions from a flux surface. A three dimensional weakly relativistic ray tracing and absorption code for electron cyclotron heating in tandem mirror plugs and barriers was developed. DOE

N81-34034# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
MHD-GENERATOR ELECTRODE DEVELOPMENT Quarterly Report, Jan. - 31 Mar. 1981
Frank D. Retallick, Laurence H. Cadoff, Donald L. Dietrick, James A. Dilmore, Edsel W. Frantti, Edgar L. Kochka, Jack A. Kuszyk, S. K. Lau, Joseph Lempert, and I. Lloyd Jun. 1981 80 p refs
(Contract DE-AC01-79ET-15529)
(DE81-028538; DOE/ET-15529/T2) Avail: NTIS HC A05/MF A01

The development of cold metallic electrodes which are alternatives to the continued use of platinum as an anode clad material is discussed. Results of laboratory screening tests are presented for materials previously tested and for other available commercial alloys. Results of anode arc tests are compared to observations from electrodes tested in an MHD generator. Laboratory electrochemical corrosion testing was conducted at two temperatures in molten salts. Initial results from these tests are reported and analyzed. Fabrication of two commerical alloys with 7% platinum included was accomplished and electrochemical testing performed. A superior high temperature performance was noted. WESTF facility checkout and activation operations have been completed and fabrication of the base copper electrode test section is reported. Engineering and test planning activities in support of WESTF tests are reported. DOE

N81-34035# Argonne National Lab., Ill.
STARFIRE: A CONCEPTUAL DESIGN OF A COMMERCIAL TOKAMAK POWER PLANT
M. A. Abdou, C. C. Baker, D. DeFreece (McDonnell Douglas Astronautics Co., St. Louis), C. Trachsel (McDonnell Douglas Astronautics Co., St. Louis), D. Graumann (General Atomic Co.), and J. Kokoszenski (Ralph M. Parsons Co.) 1980 17 p refs Presented at the 8th Intern. Conf. on Plasma Phys. and Controlled Nuclear Fusion Research, Brussels, 1-10 Jul. 1980
(Contract W-31-109-eng-38)
(DE81-023528; CONF-800707-26; IAEA-CN-39/E-1) Avail: NTIS HC A02/MF A01

STARFIRE is a conceptual design for a commercial Tokamak power plant based on the deuterium/tritium/lithium fuel cycle. The emphasis of the study is on the simplicity of the engineering design, maintainability, lower electricity cost, and improved safety and environmental features. The reactor has a 7-m major radius and produces 1200 MW of electric power. STARFIRE operates in a steady-state mode with the plasma current driven by a lower hybrid RF system. The plasma purity control and exhaust system is based on the limiter/vacuum concept, which offers unique advantages for commercial power rectors. The blanket utilizes a solid lithium compound for tritium breeding and pressurized water as the coolant. DOE

N81-34036# California Univ., Berkeley. Lawrence Berkeley Lab.
CRITICAL ANALYSIS OF THE ELECTRON GYRORELAXATION HEATING DEVICE IN THE AMBAL FACILITY
G. E. Vekshtein and V. A. Gaponov 18 Apr. 1981 14 p refs Transl. into ENGLISH from Russian Preprint no. 80-144 Sponsored by DOE
(DE81-769601; UCRL-Trans-11689; Preprint-80-144) Avail: NTIS HC A02/MF A01

Experimental testing of the idea of suppressing plasma losses along the magnetic field by means of ambipolar electric fields is described. Such ambipolar plasma traps are systems of three

magnetic mirror cells connected by end faces. The effect of electron temperature variations on plasma heating is theoretically analyzed. DOE

N81-34118# Parker (Lee W.), Inc., Concord, Mass.
ELECTROSTATIC CHARGING AND SHEATH STRUCTURE OF THE HALLEY PROBE DUE TO IMPACT-GENERATED PLASMAS
Lee W. Parker and E. G. Holeman *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 67-80 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

N81-34119# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
EXPERIMENTAL STUDIES OF IMPACT IONISATION
E. Gruen *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 81-90 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N81-34037# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CHARGE TRAPPING IN INTERFACE DOPED MNOS STRUCTURES Ph.D. Thesis
William Gardner Sutton Jul. 1981 197 p refs
(AF Proj. 6096)
(AD-A103634; AFIT/DS/EE/81-2) Avail: NTIS HC A09/MF A01 CSCL 09/1

Evaporated tungsten interface dopant, oxide-nitride interface and nitride bulk traps in MNOS structures were examined using charge centroid and thermally stimulated current (TSC) techniques. Trapping in dopant traps occurred at low injected charge levels. Above a 'saturation' level trapping occured in the nitride, and the charge centroid penertrated into the nitride. TSC measurements were made on MNS, MNOS, and interface doped MNOS devices. Analysis of TSC spectra yielded trap depths for the interface dopant and oxide-nitride interface of 1.71 - 1.86 and 0.70 - 1.34 eV respectively, and charge densities up to 6 x 10 to the 12th power/sq cm and 3x10 to the 13th power/sq cm respectively. A model of MNOS charging and discharging was developed. Electron charging is by Fowler-Nordheim (F-N) injection from the silicon into the oxide conduction band, trapping at the oxide-nitride interface and Poole-Frenkel (P-F) conduction in the nitride. Discharging occurs by: (1) F-N injection of holes from the silicon into the oxide valence band and recombination with trapped electrons at the oxide-nitride interface and the nitride, and (2) redistribution of trapped electrons toward the silicon via P-F conduction and F-N injection from the nitride into the silicon. Calculated write/erase and charge centroid characteristics were compared with measured data. GRA

N81-34038# Rockwell International Science Center, Thousand Oaks, Calif. Electronic Research Center.
HIGH CONTRAST ELECTROLUMINESCENT NUMERIC READOUT DEVICE Final Report, 2 Oct. 1978 - 1 Sep. 1980
M. K. Kilcoyne Fort Monmouth, N.J. Army Electronics Research and Development Command Aug. 1981 49 p
(Contract DAAB07-78-C-2996; DA Proj. 1L1-62705-AH-94) (AD-A103267; ERC41016.18FR; DELET-TR-78-2996-F) Avail: NTIS HC A03/MF A01 CSCL 14/2

The Microelectronics Research and Development Center of Rockwell International has completed the program encompassing the design, fabrication, and characterization of a High Contrast Electroluminescent Readout Device. The device consists of EL seven-segment numeric displays incorporating a high contrast background layer. The device also contains within its sealed package, logic and drive circuitry to operate the displays from a computer output data stream, having conventional 5-volt logic and ECD input. The package design also allows stacking the displays end to end, resulting in a multi-digit computer-type terminal display. The displays delivered during this program contain internal decode and drive circuitry not heretofore available in EL displays. The ten-pin dual in-line packages with high contrast thin film EL emitter have excellent legibility in normal ambient and good legibility in high ambient light levels. Since the EL thin film emission results by a tunneling mechanism, the display is not temperature sensitive and operates over a wide temperature range, easily meeting military temperature requirements. This report describes the design, development and fabrication of the high-contrast EL displays and details the characteristics and performance of the displays as compared to program objectives. Author (GRA)

N81-34039# Pennsylvania State Univ., University Park. Materials Research Lab.
MOLECULAR DESIGN AND SYNTHESIS OF NEW NON-CRYSTALLING SOLIDS Final Report, 1 Mar. 1978 - 28 Feb. 1981
Rustum Roy and Russell Messier Jun. 1981 158 p refs
(Contract DAAG29-80-C-0089; Grant DAAG29-78-G-0033)
(AD-A103558; ARO-15124.9-MS) Avail: NTIS HC A08/MF A01 CSCL 07/4

The general objective is to prepare and characterize novel noncrystalline thin film materials over a broad range of material's classes in order to gain a better understanding of noncrystalline solid formation behavior and to provide a scientific basis for future studies. We have prepared noncrystalline thin films covering a wide range of materials: insulators (nickel, iron and tungsten oxides; various polymers), metals (Mg-Zn alloys), and semiconductors (a number of metal-borides; cermet films like alumina-metal and polymer metal; CdTe; Si; Ge). In addition to this exploratory preparation work, we have investigated in detail the structure and bonding in a number of these materials. For understanding the short range order bonding characteristics we have used both Mossbauer and magnetic studies and Raman spectroscopy. Also using conventional TEM, high resolution STEM, and atom probe field ion microscopy we have studied the structure of noncrystalline films at the atomic level. Such nanostructural studies along with microstructural studies, primarily using scanning electron microscopy, are now allowing us to develop a general structural model for vapor-deposited noncrystalline thin film materials, which is distinctly different from the structure of conventional glasses (liquid-to-solid transformation). Due to the high energy quenching rate of vapor-to-solid transformation processes, such as RF-sputtering used extensively in this study, noncrystalline thin films can be prepared over a much wider composition range than conventional glasses. GRA

N81-34040# Rutgers - The State Univ., Piscataway, N. J. Dept. of Electrical Engineering.
INVESTIGATION OF THE TRANSPORT, DIELECTRIC AND SWITCHING PROPERTIES OF METAL OXIDE (MOX) NbO2 SUPPRESSOR DEVICES Final Report, 1 Dec. 1977 - 19 Apr. 181
B. Lalevic 15 Jul. 1981 25 p refs
(Contract DAAG29-80-C-0072; Grant DAAG29-78-G-0025)
(AD-A103572; ARO-13978.2-P) Avail: NTIS HC A02/MF A01 CSCL 09/5

NbO2 threshold switching devices have shown excellent capability as suppressor of high voltage, high current pulses when other more conventional devices cannot be applied. Stable and reproducible switching performance was observed in the Bi-NbO2-Bi device structure. Improvements in the device performance is attributed to the Bi diffusion into NbO2. This was shown by the Auger electron spectroscopy (AES) measurements. The pulsed switched single crystal devices can withstand pulse duration between 0.1-3.0 microsecond, repetition rate of 1000 Hz and current intensities of 26 Amps. peak with applied pulse duration of 20 microsecond single shot. Maximum energy was of the order of 2.52 joules. Polycrystalline devices passed maximum currents of 45 Amps. A final recommended device configuration is Au-Cr-Bi-NbO2-Au with 500 A films of each Au, Cr and Bi. It was found that Cr acted as a barrier and prevented Au diffusion. This was confirmed by AES measurements. A better adhesion and prolonged device life time was achieved. In the final device configuration a layer of silicon dioxide was

evaporated over the device to eliminate sparking and contamination effects. GRA

N81-34041# Dayton Univ., Ohio.
AUGER ELECTRON SPECTROSCOPY AND RUTHERFORD BACKSCATTERING STUDIES OF COPPER IN 2024-T3 ALUMINUM FOLLOWING ELECTROCHEMICAL ANODIZATION IN PHOSPHORIC ACID Interim Report, Aug. 1979 - Sep. 1980
J. S. Solomon Wright-Patterson AFB, Ohio AFWAL May 1981 44 p refs
(Contract F33615-78-C-5102; AF Proj. 2419)
(AD-A103585; AFWAL-TR-81-4010) Avail: NTIS HC A03/MF A01 CSCL 11/6

The effects of the electrochemical anodization of dioxidized 2024-T3 aluminum on copper were characterized by Auger electron spectroscopy and Rutherford backscattering. Anodization was performed in phosphoric acid at constant potential. Data are presented which shows that constant potential anodization of 2024-T3 is more efficient than aluminum in terms of oxide growth rates for short anodization times. However the maximum anodic oxide thickness achievable on the alloy is less than the pure metal. Copper is shown to be enriched at the oxide metal interface because of its diffusion from the bulk during anodization. The presence of copper at the oxide-metal interface is shown to affect oxide morphology. M.G.

N81-34042# Santa Barbara Research Center, Goleta, Calif.
HgCdTe SURFACE STUDY PROGRAM Semiannual Technical Report, 1 Oct. 1980 - 1 Mar. 1981
Jerry A. Wilson, Joel Silberman (Stanford Univ., Calif.), Per Morgen (Stanford Univ., Calif.), and W. E. Spicer (Stanford Univ., Calif.) Mar. 1981 28 p refs
(Contract MDA903-80-C-0469; ARPA Order 3985)
(AD-A103999) Avail: NTIS HC A03/MF A01 CSCL 20/12

The cleaved <110> surface of HgCdTe has been investigated using photoemission spectroscopy (PS) and Auger electron spectroscopy (AES). The results have been compared to CdTe. States due to Hg in the lattice were identified. The cleaved surface of p-type solid-state recrystallized (SSR) HgCdTe is seen to be enriched in Hg and shows no evidence of out-diffusion in a high vacuum (10 to the -10th power torr). The surface shows no absorption of dry molecular oxygen. Exposure to excited oxygen results in growth of Te-oxide. AES on epitaxial HgCdTe before and after ion bombardment indicates that bombardment significantly perturbs to composition of the surface region. GRA

N81-34043# Advanced Research and Applications Corp., Sunnyvale, Calif.
AN INVESTIGATION OF IMPURITY REDISTRIBUTION EFFECTS AND SOLUBILITY/DIFFUSIVITY OF Cr IN GaAs Interim Report, 1 May - 1 Nov. 1980
T. J. Magee, C. Leung, R. Ormond, R. A. Armistead, D. Stevenson (Stanford Univ., Calif.), C. A. Evans, Jr., D. S. Day (Avantek, Inc.), and M. Omur 1 Nov. 1980 65 p refs
(Contract N00014-80-C-0482; NR Proj. 243-031)
(AD-A103900) Avail: NTIS HC A04/MF A01 CSCL 20/12

Experiments have begun on the investigation of the thermodynamics and phase equilibrium of the Ga-Cr-As system and the solubility and diffusivity of Cr in GaAs under selected conditions of temperature and source composition. Allied experiments on the influence of defects in GaAs have shown that stable front surface Cr depletion channels can be formed in GaAs for retarding the outdiffusion of Cr. Investigations of the influence of non-stoichiometric regions introduced by implantation (as predicted by the Christel-Gibbons model) on the redistribution of Cr after annealing have shown a definitive correlation between predicted damage zones and experimentally observed gettering regions. The field enhanced diffusion of Cr into contact regions of GaAs-FETs under accelerated thermal-bias stress testing has now been shown to be correlated with the degradation of contacts during stress. Separate experiments on CZ-Si containing oxygen have demonstrated that oxygen is extremely mobile in Si and can be gettered into damage regions at temperatures as low as 350 C. Author (GRA)

N81-34044# Advanced Research and Applications Corp., Sunnyvale, Calif.
INVESTIGATION OF IMPURITY REDISTRIBUTION EFFECTS AND SOLUBILITY/DIFFUSIVITY OF Cr IN GaAs Interim Report, 1 Nov. 1980 - May 1981
T. J. Magee, C. Leung, R. Ormond, R. A. Armistead, D. Stevenson (Stanford Univ., Calif.), C. A. Evans, Jr., D. S. Day (Avantek, Inc.), and M. Omuri 1 Jun. 1981 105 p refs
(Contract N00014-80-C-0482; NR Proj. 243-031)
(AD-A104180) Avail: NTIS HC A06/MF A01 CSCL 20/12

Experiments have begun on the investigation of the thermodynamics and phase equilibrium of the Ga-Cr-As system and the solubility and diffusivity of Cr in GaAs under selected conditions of temperature and source composition. Allied experiments on the influence of defects in GaAs have shown the stable front surface of Cr depletion channels can be formed in GaAs for retarding the outdiffusion of Cr. Investigations of the influence of non-stoichiometric regions inNoduced by implantation (as predicted by the Christel-Gibbons model) on the redistribution of Cr after annealing have shown a definitive correlation between predicted damage zones and experimentally observed gettering regions. The field-enhanced diffusion of Cr into contact regions of GaAs-FETs under thermal-bias stress testing has now been shown to be correlated with the degradation of contacts during stress. Separate experiments of CZ-Si (containing oxygen) have shown that oxygen is extremely mobile in back surface damaged regions and ion implanted junctions of Si wafers. Motion and gettering of 160 into processing regions has been demonstrated at annealing temperatures as low as 350 deg. Evaluations of CdTe, HgCdTe and LPE-HgCdTe/CdTe samples currently used in IR detector fabrication have shown extreme variability in the concentrations of defects, precipitation and propagation of defects into active device regions. Author (GRA)

N81-34045# Howard Univ., Washington, D. C. Dept. of Chemistry.
RAMAN SCATTERING SPECTRA OF ImPO4
Soumyendu Guha Jun. 1981 15 p refs
(Contract N00014-80-C-0305; NR Proj. 051-733)
(AD-A103913; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

Raman scattering spectra of TmPO(4) have been studied between 5 K and room temperature. We have observed four electronic transitions between the crystal field split levels of the Tm(3+) ion (3H6) which is at the D(2d) site symmetry of the lattice. In addition to electronic transitions, we have observed eleven phonon peaks which we assign to the internal and external vibrations of the PO4(3-) ion in the irreducible representation of D(4h). Like several other rare earth phosphates and vanadates, no phase transition has been observed in this crystal.
Author (GRA)

N81-34046# Los Alamos Scientific Lab., N. Mex.
SCANNING MICROELLIPSOMETER FOR THE SPATIAL CHARACTERIZATION OF THIN FILMS
D. J. Dunlavy, R. B. Hammond, and R. K. Ahrenkiel 1981 6 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(DE81-025306; LA-UR-81-1808; CONF-810429-35) Avail: NTIS HC A02/MF A01

A polarization-modulated ellipsometer was constructed to investigate the optical properties of surfaces and transparent thin films. In the latter case, the measurement gives a unique determination of the index of refraction n and film thickness t. Using a HeNe laser light source, the beam was focused to a spot size of 50 micrometer. By stepping the sample across the focal point of the laser beam in both x and y directions, the spatial uniformity could be measured. This apparatus was particularly useful for optical profiling laser-annealed oxide films grown on GaAs. A new technique for laser annealing native oxides on GaAs produced the need for observing spatial structure with spatial resolution of less than 100 uicrometer. Here the laser pulse produced a crater in the oxide due to localized healing and subsequent densification of the film. This technique allows profiling of film index of refraction and thickness across the laser irradiated area - about 2 to 3 mm in our case. A number of applications in microelectronics are suggested. DOE

N81-34047# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
HYDROGEN AND DEUTERIUM TRAPPING IN iRON
H. H. Johnson and R. W. Lin Feb. 1981 25 p Presented at the Intern. Conf. on Effects of Hydrogen on Mater., Jackson Lake Lodge, Wyo., 26 Aug. 1980
(Contract DE-AS02-76ER-03166)
(DOE/ER-03166/T2; CONF-800850-6; COO-3166-33) Avail: NTIS HC A02/MF A01

The research described is directed at present almost exclusively to hydrogen transport, including both chemical and physical trapping, in iron and iron-base alloys. Some attention is directed to isotope effects. Efforts are made to clarify and understand hydrogen-related phenomena which are believed to be of direct importance to practical performance. DOE

N81-34048# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
GRAIN BOUNDARY DIFFUSION AND GRAIN BOUNDARY CHEMISTRY OF CR-DOPED MAGNESIUM OXIDE Technical Progress Report
V. S. Stubican 15 Jul. 1981 40 p refs
(Contract DE-AC02-78ER-04998)
(DE81-028314; DOE/ER-04998/T1) Avail: NTIS HC A03/MF A01

The grain boundary product D' delta (where D' is the grain boundary diffusion coefficient and delta is the grain boundary width) of Cr51 in MgO and Cr-doped MgO was determined at 1200 to 1450 C for Cr(3+) concentrations of 0 to 0.56 atom percent. By assuming a grain boundary width to be between 100 and 1000 A the grain boundary diffusion coefficients are 100,000 to 1,000,000 times larger than the volume diffusion coefficients. D' delta increased with increasing CR(3+) concentration, but the activation energy for diffusion of 180 + or - 8 kJ/mole was the same for all specimens. DOE

N81-34049# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELECTROCHEMICAL PROPERTIES OF SMALL CLUSTERS OF METAL ATOMS AND THEIR ROLE IN THE SURFACE ENHANCED RAMAN SCATTERING
W. J. Plieth Jun. 1981 24 p refs
(Contract W-7405-eng-48)
(DE81-024198; LBL-12955) Avail: NTIS HC A02/MF A01

Starting with equations for the shift of the reversible redox potential of small metal particles with size, the electrochemical properties of these particles are discussed. Approximate equations are given for the relationship between the particle size and the surface charge, the potential of zero charge, the surface potential, work function and quantities related to this function. The influence of these properties on redox reactions, electrosorption, and chemisorption are discussed. The results are used to explain experimental observation in connection with the surface enhanced Raman effect. DOE

N81-34050# Sandia Labs., Albuquerque, N. Mex.
METHODS FOR FAST PULSED THERMAL DIFFUSIVITY MEASUREMENTS IN THIN FILMS
D. A. Benson and G. D. Miller 1981 24 p refs Presented at the Intern. Joint Conf. on Thermophys. Properties, Gaithersburg, Md., 15 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023747; SAND-80-2694C; CONF-810683-3) Avail: NTIS HC A02/MF A01

A modification of the pulse heating technique for thermal diffusivity measurements is described for use with thin vapor deposited coatings. This method uses a capacitive storage pulsed power system to resistively heat thin substrates in a 20 microsecond time interval to temperatures within the 1000 to 3000 K range. The rapid heating allows not only the study of thin coatings, but also allows data unperturbed by sample changes to be collected on materials which experience gradual restructuring or mass loss at high temperatures. A family of experiments for Sc and ScD sub x/ films ranging from 5 to 10 microns thick are discussed and compared with previous thermal diffusivity data. DOE

N81-34051# Argonne National Lab., Ill.
SUPERCONDUCTIVITY AND MAGNETISM IN THE SERIES R SUB 2 Fe SUB 3 Si SUB 5 BY MOESSBAUER AND MAGNETIZATION MEASUREMENTS
J. D. Cashion, G. K. Shenoy, D. Niarchos, P. J. Viccaro, A. T. Aldred, and Charles M. Falco 1980 8 p refs Presented at the 26th Ann. Conf. on Magnetism and Magnetic Mater., Dallas, 11-14 Nov. 1980
(Contract W-31-109-eng-38)
(DE81-023804; CONF-801134-15) Avail: NTIS HC A02/MF A01

Members of the R2Fe3Si5 series become either superconducting or magnetically ordered depending on whether the metal atom R (= rare earth, Y or Sc) is diamagnetic or paramagnetic respectively. Moessbauer effect and magnetization measurements were made to determine the magnetic state of the iron and the nature of the superconducting electrons. Iron 57 Moessbauer measurements on the Sc, Dy and Er compounds all showed two partially resolved, quadrupole split spectra at all temperatures from 300 to 1.5 K, indicating that there is no resolvable magnetic interaction at the iron site. The nature of the superconducting electrons in the series is discussed in the light of available measurements. DOE

N81-34052# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Labs.
HIGH COMPRESSION CRYSTAL GROWTH SYSTEM
H. F. Nieman, A. A. Walton, B. M. Powell, and G. Dolling Jan. 1980 26 p refs
(AECL-6777) Avail: NTIS (US Sales Only)HC A03/MF A01; DOE Depository Libraries

This report describes the construction and operating procedure for a high compression crystal growth system, capable of growing single crystals from the fluid phase over the temperature range of 4.2 K to 300 K, at pressures up to 900 MPa. Some experimental results obtained with the system are given for solid (beta)-nitrogen. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N81-34053# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR).
A NEW APPROACH TO THE EIGENVALUE PROBLEM IN QUANTUM MECHANICS: CONVERGENT PERTURBATION THEORY FOR RISING POTENTIALS
A. V. Turbiner 1979 14 p refs
(ITEP-117(1979)) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

An iteration procedure for solution of the Schroedinger equation with arbitrary potential is proposed. Both the eigenvalues and eigenfunctions are represented in the form of a series which is well convergent under certain conditions. The solution of the K-dimensional Schroedinger equation within the proposed scheme reduces to a problem of the k-dimensional electrostatics. As an example potentials x (2n) (n=2,3,4) and m(2) x (2) + gx (4) in a one dimensional space are considered. It is shown that closed analytical expressions for corrections at all orders of the perturbation theory can be derived. DOE

N81-34054# Tel-Aviv Univ. (Israel).
GAUGE-THEORY GHOSTS AND GHOST-GAUGE THEORIES
Y. Neeman 1981 22 p refs
(Contract DE-AS05-76ER-03992)
(DE81-026749; DOE/ER-03992/442) Avail: NTIS HC A02/MF A01

The geometric unitarity equations for an internal gauge theory, for a supergauge, for the Kalb Ramond field, and for a noninternal

gauge are reviewed. Results relating to the role of antighosts are presented. DOE

N81-34055# Sandia Labs., Albuquerque, N. Mex.
BALANCE LAWS FOR DEFORMABLE CONTINUA
W. Herrmann Aug. 1981 44 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028999; SAND-81-1757) Avail: NTIS HC A03/MF A01

Equations governing the motion of deformable media are collected in uniform notation. Heat conduction as well as externally prescribed body forces and heat sources are included. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N81-34056 British Library Lending Div., Boston Spa (England).
LIBRARY USER EDUCATION: ARE NEW APPROACHES NEEDED?
Peter Fox, ed. Mar. 1980 116 p refs Conf. held at Cambridge, England, 1979
(BLL-BLRDR-5503; ISBN-0-905984-45-5; ISSN-0308-2385) Avail: British Library Lending Div., Boston Spa, Engl.: £7.00

Library user education and the need for new approaches were discussed. The following topics are presented: (1) users and their needs; (2) teaching and learning; (3) review of the national situation in Britain and the United States; and (4) types of user education materials. Past research and directions for future research are examined. E.A.K.

N81-34057 British Library Lending Div., Boston Spa (England).
EDUCATIONAL INFORMATION AND THE TEACHER
Dai Hounsell, Elaine Martin, Gill Needham, and Haydn Jones Apr. 1980 101 p refs
(BLL-BLRDR-5505; ISBN-0-905984-52-8; ISSN-0308-2385) Avail: British Library Lending Div., Boston Spa, Engl. £18.00

The findings of a study of schoolteachers' needs for information about educational research and development how teachers came by such information and the use they made of it in their work are reported. Two modes of investigation were employed: a questionnaire and interview survey of teachers in the North West of England, and the deelopment of a mobile display which was used to introduce teachers to sources of information and to explore their knowledge of these sources. It is indicated that a greater and more active use of educational information than is commonly believed is used. Almost all the teachers thought being well informed was important and over half was influenced by research, but several obstacles were seen as hindering information flow between researchers and teachers. E.A.K.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N81-34058# Army Inventory Research Office, Philadelphia, Pa.
SUPPLY CONTROL STUDY INSTABILITY Final Report
Bernard B. Rosenman Jun. 1981 25 p refs
(AD-A103895; IRO-285) Avail: NTIS HC A02/MF A01 CSCL 05/1

This report deals with instabilities in computer-recommended supply actions in successive supply control studies where the recommended action can change from buy to cutback, cutback to buy, etc., from one study to the next. Statistics are given on the magnitude of the problem at the DARCOM MRCs and on most frequently encountered causes. Some recommendations to improve the situation are given. Author (GRA)

N81-34059# Naval Postgraduate School, Monterey, Calif.
AN EXAMINATION OF PROJECT MANAGEMENT AND CONTROL REQUIREMENTS AND ALTERNATIVES AT FNOC
M.S. Thesis
Charlotte Ruth Gross Jun. 1981 86 p refs
(AD-A104127) Avail: NTIS HC A05/MF A01 CSCL 05/1

The need for a project information and control system at FNOC was examined. Personal interviews and checklists were used to determine user requirements. Several manual and automated alternatives were presented. The author concluded that the purchase of a software package, would in all probability, be the most efficient and effective alternative. Several packages were evaluated and 3 packages were finally presented for more extensive review by FNOC staff. Author (GRA)

N81-34060# Wisconsin Univ. - Madison. Mathematics Research Center.
THE SUBJECTIVIST VIEW OF DECISION-MAKING Technical Summary Report
Dennis V. Lindley Jul. 1981 34 p refs
(Contract DAAG29-80-C-0041)
(AD-A103879; MRC-TSR-2248) Avail: NTIS HC A03/MF A01 CSCL 12/1

The subjectivist, Bayesian paradigm for a decision-maker is described. It is shown how the notion of utility, and the principle of maximizing expected utility both depend on the description of uncertainty through probability. The justification for the necessity of this description due to de Finetti is outlined. The twin, practical problems of the evaluation of the decision-maker's probabilities and utilities are discussed. Probability, as used in the paradigm, is a subjectivist notion which is distinct from the chance, or frequentist, concept and there is discussion of this difference. The calculations for the analysis of a decision tree are described and the notions of the utility of data developed. The statistical analysis of data that flows from the paradigm is described and the basic, likelihood principle derived and discussed. The material is illustrated by a simple example from insurance. Author (GRA)

N81-34061# Florida Univ., Gainesville. Water Resources Research Center.
INTEGRATING LAND AND WATER MANAGEMENT
Frank E. Maloney and Richard Hamann Mar. 1981 141 p refs
(Contracts DI-14-34-0001-9010; DI-14-34-0001-0110; OWRT Proj. A-073-FLA(1))
(PB81-209074; WRRC-Pub-54; W81-03259) Avail: NTIS HC A07/MF A01 CSCL 05A

Numerous programs for the planning and regulation of land and water use currently operate in Florida. Together they form an extremely complex management system. This system is not well integrated, but it demonstrates many subtle interrelationships. The major land and water management programs are described and their mutual relations are examined. Improved integration of land and water management can be attained. A range of management techniques is available to enhance communication and resolve inconsistencies. Several methods are discussed, including reorganization, review and comment procedures, coordinating councils, planning, and coordinated permitting. GRA

N81-34062 Loughborough Univ. of Technology (England). Dept. of Library and Information Studies.
ADMINISTRATIVE EFFECTIVENESS, ATLAS NO. 1
[1981] 30 p Sponsored by British Library Lending Div.
(BLL-BLRDR-5529; ISBN-0-904924-21-1) Avail: British Library Lending Div., Boston Spa, Engl.

Instructions for the library management research unit's administrative effectiveness management information system are outlined. Distinction is made between management information about users of the library, and management information on operations and staff of the library. The administrative effectiveness system is designed as a straightforward management information, and costing system. The libraries' efficiency and effectiveness is suggested. The recording of less regular or unusual activities to encourage self recording whenever possible by all grades of staff is recommended. E.A.K.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; anp library science.

For computer documentation see *61 Computer Programming and Software.*

N81-34063 Hatfield Polytechnic (England). National Reprographic Centre for Documentation.
AUTOMATED RETRIEVAL OF MICROFORMS: A GUIDE AND DIRECTORY
Alan Horder 1980 65 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5590; NRCd-Publ-14) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

An overview of the state of the art of automated retrieval of microforms is given. The checkered history of early automated microform retrieval systems is reviewed and the commercial systems currently available are discussed with particular reference to the types of microform and retrieval principles employed. A directory containing brief specifications of each of the automated microform systems currently available, together with addresses of the suppliers concerned is presented. J.M.S.

N81-34064 Leeds Polytechnic (England) School of Librarianship
TEACHING ON-LINE INFORMATION RETRIEVAL AND AUTOMATED CIRCULATION CONTROL. PART 1: ON-LINE INFORMATION RETRIEVAL Final Report, Jul. 1978 - Jul. 1979
J. Brian Livesey Nov. 1979 75 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5592) Avail: British Library Lending Div., Boston Spa., Engl.

An investigation carried out into the use of 'intelligent' terminals in teaching on-line bibliographic searching is described. A number of self-instructional teaching packages written for use with a Hewlett-Packard HP2645A terminal which cover the use of the terminal, access to the host (BLAISE) and information retrieval from MEDLINE are described. An additional package is available on the terminal to test the students' understanding of the BLAISE system and the MEDLINE data base, the students' response being monitored automatically by the terminal. The results of an evaluation of the teaching packages and the lecture program they replaced are presented. The packages proved to be an effective and popular method of learning about on-line retrieval but did not result in any significant improvements in on-line performance compared to more traditional techniques. J.M.S.

N81-34065 British Library Lending Div., Boston Spa (England).
A MANUAL FOR THE EVALUATION OF CURRENT AWARENESS BULLETINS
G. M. Francis, C. Mullings, and T. D. Wilson Mar. 1981 288 p refs
(BLL-BLRDR-5584; ISBN-0-905984-60-9; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

This manual is based on the evaluation of two current awareness bulletins in eight local authorities and a university department. The bulletins were cooperatively produced but the manual can be applied to bulletins produced independently. The manual includes detailed instructions on establishing costs, collecting use-data, and carrying out surveys. The survey questionnaires and interview schedules have been pilot-tested and revised and examples are given of the kind of data obtained. Computer routines for the analysis of use-data and survey-data are provided, partly in the form of Statistical Package for the Social Sciences instructions, and partly in the form of specially written Cobol programs. Author

N81-34066 Bath Univ. (England). Library.
DESIGN OF INFORMATION SYSTEMS IN THE SOCIAL SCIENCES
Maurice Line 1 Jan. 1980 171 p refs
(BLL-BLRDR-5524-21) Avail: British Library Lending Div., Boston Spa, Engl.

Literature use in the social sciences is investigated. The interrelationships of subjects, countries, languages, and forms of material are considered. The decay of use over time is investigated. The distribution of citations among cited works is demonstrated. The most cited journals, monograph authors, and monograph titles are determined. J.D.H.

N81-34067 British Library Lending Div., Boston Spa (England).
ON-LINE EXPERIMENTS IN PUBLIC LIBRARIES
A. J. Oulton and A. Pearce Apr. 1980 63 p refs
(BLL-BLRDR-5532; ISBN-0-905984-56-0; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The establishment of on-line library services during a pre-public phase and the first six months of public operation is described including reactions of library staff and end users. A steady growth in the service providing access to Lockheed DIALOG, SDS ORBIT, SLAISE, IRS DIALTECH, and the New York Times INFORMATION BANK is observed. Response, which is monitored by participant observation and interviews, is shown to be favorable. Some potential problem areas are discussed. The experience gained from projects to introduce on-line information retrieval services for the public is discussed. The question of charging for such services is addressed. J.M.S.

N81-34068 British Library Lending Div., Boston Spa (England). Research and Development Dept.
A PLANNING PROCESS FOR PUBLIC LIBRARIES
C. Dyson Mar. 1980 35 p refs
(BLL-BLRDR-5541) Avail: British Library Lending Div., Boston Spa, Engl.

Alternative methods of measuring library services were investigated and a planning process which can be used by any public library to plan and evaluate service programs appropriate to its community's specific needs was developed and tested. Formulation of public library standards for effective performance in addition to efficient management of resources were discussed. J.M.S.

N81-34069*# Stanford Univ., Calif. Dept. of Engineering-Economic Systems.
A SURVEY OF MACHINE READABLE DATA BASES
Peter Matlock Aug. 1981 60 p refs
(Contract NASw-3204)
(NASA-CR-164859; Rept-34) Avail: NTIS HC A04/MF A01 CSCL 05B

Forty-two of the machine readable data bases available to the technologist and researcher in the natural sciences and engineering are described and compared with the data bases and date base services offered by NASA. J.D.H.

N81-34070# Logistics Management Inst., Washington, D. C.
DEFENSE ENERGY INFORMATION SYSTEM (DEIS): DEIS-80 DESIGN SYSTEM SPECIFICATION, REVISION A
Joan Lengel Jul. 1981 220 p
(Contract MDA903-81-C-0253)
(AD-A104016; LMI-DP103) Avail: NTIS HC A10/MF A01 CSCL 15/5

The Defense Energy Information System (DEIS) is a worldwide, automated, energy management information system. It provides data on petroleum products used as mobility fuels by the military departments as well as most energy sources used for utility services at DoD installations. DEIS consists of two related information systems. DEIS I reports the disposition and consumption of petroleum products, notably aviation gasoline, jet fuels, motor gasoline, distillate and residual oils within DoD. DEIS II reports the consumption of utility energy, such as electricity, natural gas, purchased steam/hot water, fuel oil and coal. It reports the consumption and generation of energy from renewable sources. This document presents the System Specification for the enhanced DEIS (DEIS-80). As specified, DEIS-80 improves the utility of the existing system by including additional data, supporting management queries of the DEIS-80 data bases on-line, and providing the capability for automated data analysis. Since the publication of the DEIS-80 specifications in August 1980, several design features have been identified that required clarification and modification. The design System Specification

will continue to serve as the guide for the computer programming of DEIS-80. It adheres to the requirement for system specification in the Automated Data System Documentation Standards.
Author (GRA)

N81-34071# Freie Univ., Berlin (West Germany). Inst. fuer Bibliothekarausbildung.
FIABID/DV. RESEARCH PROJECT. INTEGRATED CONCEPTION FOR EDUCATION FOR LIBRARY, INFORMATION AND DOCUMENTATION PART 2: EDP-CURRICULUM
Final Report
Detlef Skalski and Roswitha Reppich Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 162 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-80-014; ISSN-0170-8996) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,60

Syllabus and partial curriculum, with implementations for practical EDP was designed. Two essential concepts are noted: curriculum modules for the construction of course units and computer laboratory training. The modular approach corresponds as well with the required integration of EDP into conventional parts of the curriculum as with the stronger connection between the library science and information sciences education. A survey of modules with EDP educational goals is presented, and is correlated with a general library and information science syllabus. The design and realization of several units with laboratory components, training materials and concepts, implementation and management of a computer laboratory, are evaluated.
Author (ESA)

N81-34072 London Univ. (England).
ORGANISATION AND IMPACT OF A TRAVELING WORKSHOP FOR ON-LINE INFORMATION RETRIEVAL IN THE UNIVERSITY OF LONDON
A. Vickery, D. Wiseman, G. Pratt, and G. Burgess Feb. 1981 137 p refs
(BLL-BLRDR-5612) Avail: British Library Lending Div., Boston Spa, Engl.

The effectiveness of a mobile training and search service is assessed. The objectives of the project were to assess the educational impact of the workshops of the institutions visited, in particular on academic staff and research students, and to study problems associated with the organization of a traveling workshop. Analyses organizational problems of the workshop, such as promotion, transport of equipment, preparations to be made before each demonstration, and the modes of presentation. The use of an audio-visual teaching aid, the Mediatron, is discussed. The costs of various modes of workshop are estimated. J.D.H.

N81-34073 Manchester Coll. of Science and Technology (England). Center for Computational Linguistics.
FEASIBILITY STUDY OF THE ESTABLISHMENT OF A TERMINOLOGICAL DATA BANK IN THE UK
J. C. Sager Jan. 1981 85 p refs Sponsored by the British Library Research and Development Dept.
(BLL-BLRDR-5642; CCL/UMIST-81/8) Avail: British Library Lending Div., Boston Spa, Engl.

Linguistic data banks containing the vocabulary and phraseology of special languages are established services in industrialized countries, providing tools for technical writers, translators, information scientists, standardization agencies, and publishers. The use, cost, and organization of existing data banks were analyzed and a limited survey of data suitable for incorporating into a British linguistic data bank was conducted. On this basis a model specification was evolved for a British linguistic data bank and was presented to potential British contributors and users with a view to assessing their interest in such a service. The model was refined after a selective questionnaire followed by interviews. Considerable interest in such a service was established. User types and their needs and expectations were determined and certain desirable characteristics of a British linguistic data bank were identified: it should be multifunctional, multilingual, widely accessible and be a single national center working in cooperation with producers and users of terminology. J.M.S.

N81-34074 College of Librarianship Wales, Aberystwyth. Dept. of Information Systems Studies.
SOFTWARE FOR PRINTED INDEXES: A GUIDE
C. Armstrong [1981] 100 p Sponsored by the British Library Research and Development Dept.
(BLL-BLRDR-5622; ISBN-0-85142-142-3) Avail: British Library Lending Div., Boston Spa, Engl.

A descriptive guide to software packages for printed, or page-form, index production is presented. The data were gathered mainly by questionnaire with some supplementary interviews, and the processed information from this exercise was approved by the suppliers of the various packages before inclusion. Criteria for selection of the software for inclusion included ready availability, potential transferability, proved proven usability, and reputation. J.M.S.

N81-34075 British Library Lending Div., Boston Spa (England).
LIBRARY AND INFORMATION SERVICES FOR THE LEGAL PROFESSION
C. Miskin Jul. 1981 64 p refs
(BLL-BLRDR-5633; ISBN-0-905984-73-0; ISSN-0308-2385) Avail: British Library Lending Div., Boston Spa, Engl.

A brief survey of the library and information services available, in England, for the legal profession is given. The nature of the legal data base which needs to be exploited fully by both lawyers and law librarians so that they can perform their functions adequately is described. Brief descriptions of the education, organization, and training of both lawyers and law librarians are given. Details of the various types of law library and information unit available to lawyers are included. These details include bookstock, staffing, and services. An outline is given of the different computerized legal information retrieval systems now available. A survey of the few user studies which have been carried out in this field is provided. Suggestions are given for areas of future research. J.M.S.

N81-34076 Royal Society, London (England).
A STUDY OF THE SCIENTIFIC INFORMATION SYSTEM IN THE UK: SUPPORTING PAPERS
May 1981 82 p
(BLL-BLRDR-5629) Avail: British Library Lending Div., Boston Spa, Engl.

An attitude questionnaire was administered to four groups of scientists: biological scientists in research institutes and university departments in Aberdeen; physical scientists in the University of Oxford; physicists at the National Physical Laboratory; and biologists, biochemists, and chemists at I.C.I. Pharmaceuticals Division. The questionnaire used included some questions about new developments in information techniques, such as synopsis journals and on-line information retrieval. It was found that certain questions produced rather unsurprising results which confirmed the results of an earlier survey. The responses are analyzed in terms of formulating policy on information matters pertinent to the scientific community. J.M.S.

N81-34077 Royal Society, London (England). Scientific Information Committee.
A STUDY OF THE SCIENTIFIC INFORMATION SYSTEM IN THE UNITED KINGDOM
May 1981 44 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5626; ISBN-0-85403-166-9) Avail: British Library Lending Div., Boston Spa, Engl.

Economic factors involved in the scientific publication (journals) and library chain are addressed. Specifically, the dependence of the scientific journals on the international library market for income and budget cuts within libraries forcing subscription cancellations based on the availability of loans and/or photocopies under inter-library cooperation schemes are considered. Recommendations and several courses of action to relieve the situation are discussed. J.M.S.

N81-34078 Sheffield Univ. (England). Postgraduate School of Librarianship and Information Science.
CONTENT REPRESENTATION FOR RETRIEVAL
A. Harding and M. F. Lynch Oct. 1980 15 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5607) Avail: British Library Lending Div., Boston

Spa, Engl.

The reduction of vocabulary size in indexing languages and the relationship of the vocabularies and their size to retrieval effectiveness was investigated. The Cranfield test collection is used (1400 documents, 225 queries) and both title-word and index term vocabularies are studied. The method of evaluation involves linear associative retrieval tests and the use of the effectiveness function of van Rijsvergen. In each case a comparision of the effectiveness of the reduced vocabularies with the standard vocabulary represented by the stemmed or unstemmed words is undertaken. J.M.S.

N81-34079# British Library Lending Div., Boston Spa (England).
DEVELOPMENTS IN OPTICAL DISC TECHNOLOGY AND THE IMPLICATIONS FOR INFORMATION STORAGE AND RETRIEVAL
R. Barrett Jun. 1981 80 p
(BLL-BLRDR-5623; ISBN-0-905984-71-4; ISSN-0308-2385)
Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Manufacturers and prospective users were surveyed. The report indicates that prospects for the use of optical discs in textural and graphical information storage and retrieval are good. There are applications for replicated video discs especially if they can be mastered with digitally coded information, but the major impact will come with the digital optical recording systems that provide write and read facilities. T.M.

N81-34080# British Library Lending Div., Boston Spa (England).
THE NEGLECTED RESOURCE: NON-USAGE OF LIBRARY-INFORMATION SERVICES IN INDUSTRY AND COMMERCE
Margaret Slater 1981 72 p refs
(BLL-BLRDR-5628; ISBN-0-85142-145-8;
ASLIB-Occasional-Publ-25) Avail: British Library Lending Div., Boston Spa, Engl.

A small-scale exploratory study of sub-optimal usage of industrial and commercial library information services was carried out. Nonuse, misuse (and even abuse) were examined from the viewpoint of unit managers. The reality (nature and extent) of any nonusage problem, also the feasibility and utility of further investigation were assessed. J.M.S.

N81-34081# British Library Lending Div., Boston Spa (England).
ON-LINE INFORMATION IN PUBLIC LIBRARIES: A REVIEW OF RECENT BRITISH RESEARCH
Nick Moore, ed. Aug. 1981 91 p refs
(BLL-BLRDR-5648; ISBN-0-905984-76-5; ISSN-0308-2385)
Avail: British Library Lending Div., Boston Spa, Engl.

All the British Library Research and Development Department-supported research projects which have explored the introduction and use of on-line services, including Prestel, in public libraries are described. J.D.H.

N81-34082# British Library Lending Div., Boston Spa (England).
THE TEACHING OF ONLINE CATALOGUING AND SEARCHING AND THE USE OF NEW TECHNOLOGY IN U.K. SCHOOLS OF LIBRARIANSHIP AND INFORMATION SCIENCE
Lucy A. Tedd Apr. 1981 127 p refs
(BLL-BLRDR-5616; ISBN-0-905984-67-6; ISSN-0308-2385)
Avail: British Library Lending Div., Boston Spa, Engl.

In late 1979, the 16 schools of librarianship and information science in the U.K. were surveyed on their teaching of online cataloguing and searching as well as their use of new technology, such as microcomputer systems, intelligent terminals, viewdata systems and so on. The results are described along with details of work in this area in seven of the schools. Recommendations for further work in this area are included. T.M.

N81-34083# Brighton Polytechnic (England). Dept. of Communication and European Studies.
TEACHING AND TRAINING FOR ON-LINE WORK IN LIBRARIES Final Report, Jun. 1978 - Jun. 1980
Aldyth D. Scott Dec. 1980 70 p refs Sponsored by British Library Lending Div.
(BLL-BLRDR-5604) Avail: British Library Lending Div., Boston Spa, Engl.

The methods of teaching and training relating to on-line work in libraries are examined with special reference to cost. The cost of using external data bases was estimated within programs designed to make maximum use of inhouse packages. Lockheed DIALOG and BLAISE MARC were used in student programs. Cost of search for each system are compared. Given knowledge of the MARC record, students were able to move from DIALOG to BLAISE MARC with little additional preparation. Inhouse programs are essential for student work in bibliograhic data handling. The HP2645A was found acceptable for student and trainee use. The facility to transmit cassette recorded IPSS passwords aided efficiency and reduced cost. A teaching tape on cursor-controlled editing of BLAISE records was produced. J.D.H.

N81-34084 British Library Lending Div., Boston Spa (England).
NON-BIBLIOGRAPHIC ONLINE DATABASE: AN INVESTIGATION INTO THEIR USES WITHIN THE FIELDS OF ECONOMICS AND BUSINESS STUDIES
B. Houghton and J. C. Wisdom May 1981 26 p refs
(BLL-BLRDR-5620; ISBN-0-905984-70-6; ISSN-0308-2385)
Avail: British Library Lending Div., Boston Spa, Engl.

A state-of-the-art survey of nonbibliographic online database services is presented. Emphasis is on the potential of access to nonbibliographic online databases and the development of teaching packages to introduce potential users to nonbibliographic online databases. J.M.S.

N81-34085# British Library Lending Div., Boston Spa (England).
HOW TO GO ON-LINE. GUIDELINES FOR THE ESTABLISHMENT OF ON-LINE SERVICES IN PUBLIC LIBRARIES
Stella Keenan Mar. 1980 69 p refs
(BLL-BLRDR-5533; ISBN-0-905984-57-9; ISSN-0308-2385)
Copyright. Avail: British Library Lending Div., Boston Spa, Engl.: £5.00

Guidelines to be used by public libraries considering the establishment of on-line information retrieval services are presented. The guidelines cover such topics as: service provision, cost considerations, system and equipment selection, staff considerations, promotion andd publicity, and evaluation. In addition, a timetable plan shows the decisions that need to be made at the planning, implementation and operational phase of service provision. Appendices cover organizations that can provide advice to organizations setting up on-line information retrieval services. Cost detail is also given; all the cost factors that an organization should consider in establishing an on-line information retrieval service are included. J.M.S.

N81-34086# Durham Univ. (England).
AMERICAN LIBRARY ASSOCIATION PLANNING PROCESS FOR PUBLIC LIBRARIES, UK TEST
W. E. M. Morris Nov. 1979 72 p refs
(BLL-BLRDR-5540) Avail: British Library Lending Div., Boston Spa, Engl.

A benefit assessment for system change (BASYC) in libraries and information services was conducted. A planning process for use in any public library to plan and evaluate projects which are appropriate to the needs of its community was developed. A manual to act as a guide to public library authorities in carrying out their planning processes is presented. E.A.K.

N81-34087 NPM Information Services Ltd., London (England).
INFORMATION BROKING SERVICES IN USA. REPORT OF A STUDY TRIP, APRIL AND MAY 1979
Martin S. White Jul. 1980 33 p refs
(BLL-BLRDR-5624) Avail: British Library Lending Div., Boston Spa, Engl.

The characteristics of the services offered by information brokers in the USA were examined. The origins of fee based information services in the USA is traced back to the late 1960's. How these services are marketed and costed, and how to relate the experiences of US brokers to the UK information industry is discussed. Small one person operations to large companies with an excess of 60 staff are evaluated. E.A.K.

N81-34088 Bath Univ. (England). Centre for Calalogue Research.
AUTOMATED CATALOGUING IN THE U.K.: A GUIDE TO

SERVICES
A. W. Seal 1980 114 p refs
(BLL-BLRDR-5545; ISBN-0-86197-023-3) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Four externally provided cataloging services are currently available in the U.K. - BLAISE/LOCAS, BLOMP, Oriel Computer Services, SMALCAP are described. Current membership, record retrieval and record editing and creation, output and subject processing facilities and details of costs are discussed. In addition, brief details are given of other services which are not yet fully operational. J.D.H.

N81-34089# Leeds Polytechnic (England). Library.
ORGANIZATION AND CONTROL OF LOCAL GOVERNMENT DOCUMENTATION
Barry S. Nuttall Feb. 1980 49 p refs
(BLL-BLRDR-5566) Avail: British Library Lending Div., Boston Spa, Engl.

The identification, location and acquisition of local government documents is considered. Visits to planning departments of local authorities in Yorkshire, Humberside and Cleveland revealed that very few authorities have the necessary administration to promote effective publication of their documents. The poor coverage of local government documents by five selected abstract/index services is examined. Improvement by local authorities in their publication practices and policies and a more professional approach to making information available, improved coverage by abstract/index services of local government documents, and the creation of a national agency for bibliographical control of local government documentation are recommended. J.D.H.

N81-34090 Leicester Univ. (England). Primary Communications Research Centre.
NEW TECHNOLOGY AND DEVELOPMENTS IN THE COMMUNICATIONS OF RESEARCH DURING THE 1980'S
A. J. Meadows 1980 43 p refs
(BLL-BLRDR-5562; ISBN-0-906083-12-5; ISSN-0144-0460) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The communication of information relating to research in the United Kingdom and possible changes in such communication during the 1980s is considered. The production, dissemination, storage, and use of such information is discussed. The social and economic factors that both affect, and are affected by, the introduction of innovations is emphasized. J.D.H.

N81-34091 Commonwealth Agricultural Bureaux, Slough (England).
TESTING AND REVISION OF GUIDELINES FOR WRITING ABSTRACTS OF PAPERS IN THE BIOLOGICAL SCIENCES Final Report, Apr. 1977 - Mar. 1980
R. J. Lewington Jul. 1980 44 p refs
(BLL-BLRDR-5568; FR-77) Avail: British Library Lending Div., Boston Spa, Engl.

Guidelines for writing abstracts were tested in practice with the cooperation of editors of journals in the biological field. During the trial editors asked authors to use the proposed guidelines when amending abstracts of papers returned for revision. Length, quality (particularly information content), and style were compared in original and revised abstracts. The revised abstracts showed that the guidelines were of value in helping authors to revise abstracts. Minor modifications to the guidelines were proposed. J.M.S.

N81-34092# British Library Lending Div., Boston Spa (England).
REPORT ON THE CONVERSION OF AN ON-LINE INFORMATION RETRIEVAL SYSTEM SIMULATOR FOR USE ON AN ITT 2020 (APPLE) MICROCOMPUTER
D. K. Johnson Jun. 1980 49 p refs
(BLL-BLRDR-5580) Avail: British Library Lending Div., Boston Spa, Engl.

The programs were converted from a suite of existing programs in use on a Digico MTS16 minicomputer. The micro-based systems described can support a small data base of bibliographic records and this can be searched interactively using a simulation of the command language used by ESA-URS QUEST. This gives the simulator potential as a teaching aid in on-lines user education. T.M.

N81-34093# City Univ., London (England). Centre for Information Science.
EDUCATION IN MEDICAL INFORMATION IN WEST GERMANY Final Report
Barbara Kostrewski Mar. 1980 74 p refs Sponsored by the British Library Research and Development Dept.
(BLL-BLRDR-5582) Avail: British Library Lending Div., Boston Spa, Engl.

Specialist education in medical documentation is addressed. Educational needs and a system of training the information specialist alongside the researcher are discussed. The approach is broad, encapsulating aspects of computing, mathematics, and medicine at different levels of expertise. The development of a cohesive system of education in medical information and documentation is highlighted. J.M.S.

N81-34094# British Library Lending Div., Boston Spa (England).
TECHNICAL PROJECT DOCUMENTATION AND ITS USE IN DESIGN Final Report
G. Pitts Jan. 1980 64 p
(BLL-BLRDR-5577) Avail: British Library Lending Div., Boston Spa, Engl.

Information which is transferred within a company in support of an engineering project, and the interface between this information and that which circulates on a national basis are examined. The strengths and weaknesses of some of the systems currently employed in industry are identified. Particular attention is given to the benefits and the usefulness of the information to the designer. A questionnaire survey of members of the Institution of Engineering designers, a questionnaire survey of members of the Institute of Information Scientists, and interviews in companies across a range of industries were conducted. The flow of technical information is examined from two view points: user views on the usefulness of the various information channels and data on the information flow patterns used in industry. J.M.S.

N81-34095# British Library Lending Div., Boston Spa (England).
PROVISION AND USE OF THESIS INFORMATION
Christine Urquhart 1979 50 p refs
(BLL-BLRDR-5513) Avail: British Library Lending Div., Boston Spa, Engl.

The future format of the thesis and its rate of award, present and proposed processing and publication methods, in particular the use of microform, are addressed. Dissemination methods for theses are reviewed, and suggested improvements for the present system are covered. Re-publication of the thesis, in whole or part, by book or journal article is discussed. The level of usage, attitudes towards theses in different subject fields, and literature on publication patterns and citation rates are reviewed. Conclusions indicate the present and future usefulness of the thesis as an information tool, and outlines areas requiring further research. Input microfilming, the operations involved in the supply of copies, dissemination methods, which include abstract journals, bibliographies, retrospective indexes, and on-line data bases are reviewed. J.M.S.

N81-34096 British Library Lending Div., Boston Spa (England).
THE USE OF MEDICAL LITERATURE: A PRELIMINARY SURVEY
G. Ford Feb. 1980 137 p refs
(BLL-BLRDR-5515; ISSN-0308-2385; ISBN-0-905984-51X) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.: £ 6.50

The requirements of users of medical literature and the extent to which these requirements are met by existing arrangements in the United Kingdom are investigated. The way the existing structure of medical libraries works for the individual health-care practitioner is considered. General medical practitioners and hospital-employed medical staff were surveyed to establish the relative importance of different types of information need, sources of information, of reference, and supply, and barriers to information supply. Similar studies were undertaken of nurses, dentists, hospital biochemists and physiotherapists. Results are presented for all these groups to illustrate similarities and differences. A need for more guidance to existing information, and more re-packaging of information in the form of reviews and digests was found. The inter-library loan records of 21 medical libraries of different types were analyzed to determine major sources of

supply, supply delays, and age and subject distributions of loans. J.D.H.

N81-34097 College of Librarianship Wales, Aberystwyth.
USE OF ONLINE BIBLIOGRAPHY SYSTEMS IN TEACHING Final Report, Nov. 1977 - Jul. 1979
Anthony G. Curwen, R. Frederick Guy, E. Michael Keen, Valerie Large, and Peter G. Underwood Aug. 1979 219 p refs Sponsored by the British Library
(BLL-BLRDR-5523) Avail: British Library Lending Div., Boston Spa, Engl.

Aids for the teaching of on-line bibliographic searching, including overhead projector transparencies and recorded searches were evaluated. An off-line questionnaire, was developed and evaluated to test students' knowledge of on-line commands. A tape-slide demonstrating on-line searching was made. A teaching package for exposing large groups of students to the use of on-line facilities for developing and using MARC format catalog data was developed. The package comprises a lecture and recorded demonstrations, while a tape-slide and computer cataloging system based on a microcomputer are being developed. A teaching package using on-line databases to demonstrate the fundamental principles of information retrieval was also developed. Various recorded searches with teaching aids were produced. J.M.S.

N81-33529# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
LAND INFORMATION SYSTEMS: AN ATTEMPT AT DELIMINATION [LANDINFORMATIONSSYSTEME: EIN VERSUCH ZU EINER ABGRENZUNG]
Andre Frank *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 23-30 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

N81-33531# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SEDAN: A PROGRAM SYSTEM FOR ACQUISITION, REPRESENTATION, ACTUALIZATION, AND FILING OF NETWORKS [SEDAN: PROGRAMMSYSTEM ZUR ERFASSUNG, DARSTELLUNG, AKTUALISIEURUNG UND ARCHIVIERUNG VON NETZEN]
Friedrich vonKlitzing *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 43-53 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

N81-33532# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
BABEK: PORTABLE AND STANDARDIZED BASIC SOFTWARE FOR DECENTRALIZED INFORMATION AND CARTOGRAPHIC SYSTEMS [BABEK: PORTABLE UND NORMGERECHTE BASISSOFTWARE FUER DEZENTRALE BERICHTS- UND KARTIERSYSTEME]
Manfred Linder *In its* Rept. on Cartography and Geodesy, Ser. 1 1980 p 55-64 refs In GERMAN; ENGLISH summary (For primary document see N81-33527 24-42)
Avail: NTIS HC A07/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N81-34098# Bureau of Mines, Washington, D. C.
MINERALS YEARBOOK. VOLUME 2: AREA REPORTS: DOMESTIC
Apr. 1981 584 p
(PB81-211369; BM-MYB-1978-79-Vol-2) Avail: NTIS HC A25/MF A01 CSCL 05C

A statistical summary is presented of the mineral industry of each of the 50 states, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, and the Commonwealth of Puerto Rico. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N81-34099 British Library Lending Div., Boston Spa (England).
LOCAL GOVERNMENT INFORMATION IN THE UNITED STATES OF AMERICA AND CANADA: REPORT OF A STUDY VISIT IN MARCH 1979
Don Kennington Aug. 1979 45 p refs
(BLL-BLRDR-5531) Avail: British Library Lending Div., Boston Spa, Engl.

Practices in the fields of documentation and information services to local government are described and compared. The publication and acquisition of information originating with local governments, specifically urban areas, and its availability for use is considered. J.D.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N81-34100# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE ELECTRIC VEHICLE ALTERNATIVE M.S. Thesis
David E. Swanson and Michael R. VanHouse Jun. 1981 145 p refs
(AD-A103810; AFIT-LSSR-35-81) Avail: NTIS HC A07/MF A01 CSCL 13/6

This thesis discusses three basic concepts of economic analysis: the time value of money, life cycle cost, and reliability theory. Using these concepts, a method of economic analysis is developed to be used in evaluating the possible replacement of internal combustion engine (ICE) vehicles with electric vehicles (EVs). This methodology is then demonstrated by comparing two possible alternatives for replacement of the existing fleet of pickup trucks assigned to the 4950th Test Wing Aircraft Maintenance Complex at Wright-Patterson AFB, Ohio. One alternative is to replace the existing pickup fleet with new ICE pickups, the other is to replace the existing fleet with EVs. In this research effort the ICE pickup fleet is found to be the low cost alternative. Recommendations for further research and additional considerations are provided to the reader. This thesis contains an extensive bibliography on EV technology and principles of economic analysis. Author (GRA)

N81-34101# California Univ., Livermore. Lawrence Livermore Lab.
FUTURE POSSIBILITIES FOR ENERGY-STORAGE AUTOMOBILES
L. G. OConnell 23 Apr. 1981 20 p refs Presented at 91st Natl. Meeting of the Am. Inst. of Chem. Engr. Detroit, 16 Aug. 1981
(Contract W-7405-eng-48)
(DE81-769416; UCRL-85902; CONF-810814-1) Avail: NTIS HC A02/MF A01

The future of energy storage devices for use in automobile propulsion systems is assessed. Future device characteristics are projected. The propulsion system is analyzed. Future energy storage automobiles were conceptually designed and compared to each other and the baseline internal combustion engine vehicle for several levels of performance. DOE

N81-34102# Argonne National Lab., Ill.
PROJECTION OF US TRANSPORTATION NEEDS FOR BEYOND 1990: A MARKET FOR ADVANCED VEHICLES?
Martin J. Bernard, III 8 Dec. 1980 18 p refs Presented at the Elec. and Hybrid Vehicle Advan. Technol. Seminar, Pasadena,

Calif., 8 Dec. 1980
(Contract W-31-109-eng-38)
(DE81-023820; CONF-801242-7) Avail: NTIS HC A02/MF A01

Forecasts of the advanced vehicle (AV) market to the year 2000 are made considering petroleum supplies, electric power demand, economics, and environmental impacts. It is concluded that there are markets for AVs, but the competition in the market place from other technologies will be substantial. Utilities should have sufficient capacity for two or more decades to handle offpeak charging of electric hybrid vehicles but acid rain from coal power plant emissions will remain a major environmental problem, which can only raise the cost of electricity and thus AV operation. All this will tax the creativity of the AV innovator. DOE

N81-34103# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHARACTERISTICS OF AN NH3-AIR FUEL CELL SYSTEM FOR VEHICULAR APPLICATIONS
Philip N. Ross, Jr. May 1981 9 p refs Presented at the 16th ASME Intersoc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug. 1981
(Contract W-7405-eng-48)
(DE81-023245; LBL-12754; CONF-810812-20) Avail: NTIS HC A02/MF A01

The use of hydrogen air alkaline fuel cell in a consumer vehicle application is examined. An indirect ammonia-air fuel cell system is described. The advantages of the alkaline fuel cell system relative to any acid fuel cell are higher power density (factor of 2 to 3) and lower cost components (factor of 2) resulting in significantly lower total cost (factor of 4 to 6). Laboratory scale examinations of the liquid anhydrous ammonia cracking reaction and the power characteristics of an alkaline fuel cell running on cracked ammonia and air were performed. Single cell testing indicated system thermal efficiencies of 34 to 44% can be achieved at power densities of 2600-1000 W/sq m using currently known electrode technology. DOE

N81-34104# National Center for Resource Recovery, Washington, D. C.
PERFORMANCE OF AN AIR CLASSIFIER TO REMOVE LIGHT ORGANIC CONTAMINATION FROM ALUMINUM RECOVERED FROM MUNICIPAL WASTE BY EDDY CURRENT SEPARATION: TEST NO. 5.03, RECOVERY I, NEW ORLEANS Final Report
Jul. 1981 26 p
(Contract EPA-68-01-4423)
(PB81-217689; EPA-600/2-81-119) Avail: NTIS HC A03/MF A01 CSCL 13B

Aluminum cans recovered from municipal waste together with known amounts of contaminant, were processed by a zig zag vertical air classifier to remove aerodynamically light contaminant. For each run, the two output streams of the air classifier were analyzed to find the amount of aluminum cans and contaminant reporting to lights and heavies. The machine efficiency varied with contaminant loading and air flow rate. Results of these analyses, a description of the equipment, and a discussion of economic factor which pertain to the use of this device in an aluminum recovery system are included. GRA

N81-34105# National Center for Resource Recovery, Washington, D. C.
TEST OF A DOUBLE-DECK VIBRATING SCREEN EMPLOYED AS AN ALUMINUM AND GLASS CONCENTRATOR: TEST NO. 5.07, RECOVERY 1, NEW ORLEANS Final Report
Perry M. Bagalman and Kelly G. Runyon Jul. 1981 65 p refs
(Contract EPA-68-01-4423)
(PB81-217697; EPA-600/2-81-120) Avail: NTIS HC A04/MF A01 CSCL 13B

The double deck vibrating screen was tested. The tool separates the heavies from air classification of scalped primary trommel unders into an overs stream that is discarded, a middlings stream that is the feedstock to the aluminum recovery submodule and an under stream that is the feedstock for the glass recovery submodule. Samples of the three output streams from the doubledeck vibrating screen were analyzed for bulk density, moisture content, particle size, and composition and screening efficiencies, by refuse component, were determined. GRA

N81-34106# Versar, Inc., Springfield, Va.
CLASSIFYING SOLID WASTE DISPOSAL FACILITIES, GUIDANCE MANUAL
Jan. 1981 283 p refs
(Contract EPA-68-01-4767)
(PB81-218505; EPA/SW-199C) Avail: NTIS HC A13/MF A01 CSCL 13B

A manual for evaluating existing solid waste disposal facilities is presented. Evaluations are made to identify those facilities which do not comply with the 'Criteria for classification of Solid Waste Disposal Facilities and Practices' (the Criteria). As defined by the Resource Conservation and Recovery Act (RCRA) of 1976, facilities which do not comply with these Criteria are 'open dumps'. The Criteria provide minimum national standards for the protection of health and the environment from adverse effects resulting from solid waste disposal. The manual provides technical guidance on setting priorities for facility evaluations and on determining whether a particular facility violates the Criteria. GRA

N81-34107# Transportation Research Board, Washington, D.C.
TRANSPORTATION EDUCATION AND TRAINING: MEETING THE NEEDS OF THE 1980S
Larry E. Jones, Richard G. McGinnis, C. S. Papacostas, Louis M. Rae, and James H. Banks 1981 52 p ref
(PB81-218521; TRB/TRR-793; ISBN-0-309-03207-5; LC-81-9537; ISSN-0361-1981) Avail: NTIS HC A04/MF A01 CSCL 13B

Development of a unique highway safety curriculum, railroad engineering education at the undergraduate level, cooperative training programs for undergraduate students, overall assessment of a statewide certificate program in transportation, and the role of outreach activities in transportation education are discussed. Transportation engineering and the university, training of transport specialists, the transportation planning literature, state and regional roles in public surface transportation, and the education, training, and research contribution of universities are considered. J.D.H.

N81-34108# Department of Transportation, Washington, D. C. Office of Univ. Research.
PUBLISHED RESULTS OF THE PROGRAM OF UNIVERSITY RESEARCH. TRANSPORTATION RESEARCH RESULTS
Helen L. Whitfield and Russell A. Capelle 1980 61 p
(PB81-210130) Avail: NTIS HC A04/MF A01 CSCL 13F

This bibliography contains approximately 400 citations of published reports from transportation related research. Topics covered include automotive technology, energy efficiency and management, transport of hazardous materials, land use/economic impacts of transportation, and rail/guideway development.J.M.S.

N81-34109# Metropolitan Transportation Authority, Inc., New York.
DUAL-POWERED GAS TURBINE/ELECTRIC (GT/E) COMPUTER COMMUTER RAIL CARS: TEST, EVALUATION AND ECONOMICS Final Report
Donald Raskin, Charles Stark, and L. T. Klauder 5 Sep. 1980 52 p refs Sponsored in part by Urban Mass Transportation Administration, New York State Dept. of Transportation and AiResearch Mfg. Co.
(PB81-211757; UMTA-NY-06-0005-80-1) Avail: NTIS HC A04/MF A01 CSCL 13F

Eight prototype gas turbine/electric (GT/E) cars, four from the General Electric Co. (GE) and four from the Garrett Corp. were operated in revenue service on the Long Island Rail Road (LIRR). The design considerations that lead to the configuration of the GT/E cars and a description of the cars as built by GE and Garrett are presented. The costs of using GT/E trains to provide direct service to New York from select nonelectrified lines are compared with costs of extending electrification over those lines and operating conventional MU trains. Three rail lines are examined: the LIRR Port Jefferson and Oyster Bay branches, the Conrail's Upper Hudson to Poughkeepsie. GRA

N81-34110# National Center for Resource Recovery, Washington, D. C.
TEST OF AN EDDY CURRENT SEPARATOR FOR THE

RECOVERY OF ALUMINUM FROM MUNICIPAL WASTE, TEST NO. 5.01, RECOVERY 1, NEW ORLEANS Final Report
Jul. 1981 29 p refs
(Contract EPA-68-01-4423)
(PB81-217663: EPA-600/2-81-117) Avail: NTIS HC A03/MF A01 CSCL 13B

The eddy current separator that recovers aluminum cans from a processed portion of municipal refuse was tested. The objectives were to measure differences in efficiency and product rate which accompany an acceleration in AlMag throughout, i.e., test points of 2, 3, and 4 tph, respectively. The output streams of the eddy current separator were analyzed for aluminum can content in three can shape categories. The product stream was analyzed for four categories of contamination. The efficiency of the eddy current separator in recovering each shape category of aluminum cans, as well as product purity, was determined. GRA

N81-34111# National Center for Resource Recovery, Washington, D. C.
FURTHER TESTING OF AN EDDY CURRENT SEPARATOR FOR THE RECOVERY OF ALUMINUM FROM MUNICIPAL WASTE, TEST NO. 5.02, RECOVERY 1, NEW ORLEANS
Jul. 1981 31 p refs
(Contract EPA-68-01-4423)
(PB81-217671: EPA-600/2-81-118) Avail: NTIS HC A03/MF A01 CSCL 13B

Three series of test runs processed municipal refuse at the New Orleans resource recovery project are documented. For comparison, there is also one test run at each belt speed with only aluminum feed cans as the feedstock. The output streams of the eddy current separator from each test were analyzed for aluminum can content in three canshape categories; the product stream was also analyzed for contamination. The efficiency of the eddy current separator in recovering each canshape category as well as product purity were determined for each test run.
J.D.H.

88 SPACE SCIENCES (GENERAL)

N81-34112*# National Aeronautics and Space Administration, Washington, D. C.
SIGNIFICANT ACHIEVEMENTS IN THE PLANETARY GEOLOGY PROGRAM, 1981
Henry E. Holt, ed. Sep. 1981 39 p refs
(NASA-TM-83809) Avail: NTIS HC A03/MF A01 CSCL 03B

Recent developments in planetology research as reported at the 1981 NASA Planetary Geology Principal Investigators meeting are summarized. The evolution of the solar system, comparative planetology, and geologic processes active on other planets are considered. Galilean satellites and small bodies, Venus, geochemistry and regoliths, volcanic and aeolian processes and landforms, fluvial and periglacial processes, and planetary impact cratering, remote sensing, and cartography are discussed. J.D.H.

N81-34113# European Space Agency, Paris (France).
THE COMET HALLEY PROBE. PLASMA ENVIRONMENT
Norman Longdon, ed. May 1981 105 p refs Proceedings of Workshop Series, Heidelberg and Noordwijk, Netherlands, 1979-1980
(ESA-SP-155) Avail: NTIS HC A06/MF A01

Charing effects expected during the encounter of the spacecraft Giotto with Halley's comet are discussed. Ion-electron pair production and residual ionization caused by the impacts of cometary neutrals and dust particles and ionization caused by impact with large dust particles were studied. Models of the probe electric environment and of charging and plasma emission effects are described. Experimental studies of impact ionization are reviewed. For individual titles, see N81-34114 through N81-34121.

N81-34114# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
ION-ELECTRON PAIR PRODUCTION BY THE IMPACTS ON THE HALLEY PROBE SHIELD **c90**
E. Gruen and R. Reinhard (ESTEC, Noordwijk, Netherlands) *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 7-21 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

Current models for the number densities of cometary neutrals and dust particles for Halley at 1.5 AU pre-perihelion and suitable assumptions for ionization degrees are used to investigate the number of ions and electrons created by impacts of cometary neutrals and dust particles on the probe shield. A thin gold coating on the front sheet of an aluminum shield is proposed to reduce the number of ions produced by impacts of neutrals by several orders of magnitude. Depending on the mass of the impacting dust particle and the distance from the nucleus the impacts of dust particles on the probe shield can be conceived either as a quasi-continuous or a discrete phenomenon. In the first case the number of ions and electrons produced by dust particle impacts must be added to the number of ions and electrons produced continuously by impacting cometary neutrals to get the total impact-generated plasma around the probe; in the second case the dust particle impacts may cause discrete large probe potential pulses each lasting 0.1 ms. Author (ESA)

N81-34115# Hochschule der Bundeswehr, Neubiberg (West Germany). Fachbereich Luft- und Raumfahrttechnik.
RESIDUAL IONIZATION AFTER IMPACT OF LARGE DUST PARTICLES **c90**
K. Hornung and S. Drapatz (Max-Planck Inst. fuer Extraterrestrische Physik) *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 23-37 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

The degree of ionization in a rapidly expanding gas cloudlet, produced by high velocity impact of large dust particles on a solid surface is investigated. The dynamics of shock wave compression of the impinging particle, the thermodynamics of the high pressure shock state as well as the characteristics of equilibrium and nonequilibrium expansion of the partially ionized gas are considered. Calculations are extended to large particles (up to 1000 microns) at an impact velocity of w = 57 km/sec, the flyby velocity of the planned Halley probe. Author (ESA)

N81-34116# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
A PLANAR MODEL OF THE PROBE ELECTRIC ENVIRONMENT **c15**
Rejean J. L. Grard *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 39-45 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

A computer program was written to investigate the structure and dynamic behavior of the charged particle density distribution for the case of a planar surface emitting ions and electrons at the same rate. Ions and neutral molecules impinging on the surface of the Halley's Comet probe extract secondary electrons and ions which control the electric properties of the shield and of its immediate environment. An ion and an electron layer form in the vicinity of the shield at distances of the order of the ion and electron Debye lengths, respectively. The potential of the surface is positive on average and is a function of the electron mean kinetic energy. A positive potential barrier develops at the location of the ion layer and its height is governed by the sum of the electron and ion mean kinetic energies. Author (ESA)

N81-34117# Technische Hochschule, Darmstadt (West Germany). Angewandte Geophysik.
SYMMETRIC MODEL OF SPACECRAFT CHARGING AND PLASMA EMISSION EFFECTS **c18**
H. Maassberg, U. Isensee, and G.-H. Voigt *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 47-65 refs Sponsored by Bundesministerium fuer Forschung- und Technologie and DFVLR (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

The electrostatic charging of Halley's probe and the interactions with the plasma are investigated. The Vlasov equations describing these interactions are integrated analytically by means of the particle invariants of motion. The particle and current

densities of all plasma constituents are calculated. This formalism is carried out by a numerical iteration scheme and converges to the self-consistent potentials; the solution of the current balance equation which is included in the iteration scheme yields the floating potential (zero total current). The self-consistent potentials and particle densities are calculated for those distances to the nucleus, where the charged particle emission is approximately homogeneous and stationary. In all calculations with plasma emission due to the cometary dust impact, the mass of the ions produced by the dust impact is found to have only a very small influence on the potential barrier. Only the floating potential decreases with decreasing ion mass. Author (ESA)

N81-34118# Parker (Lee W.), Inc., Concord, Mass.
ELECTROSTATIC CHARGING AND SHEATH STRUCTURE OF THE HALLEY PROBE DUE TO IMPACT-GENERATED PLASMAS c75
Lee W. Parker and E. G. Holeman *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 67-80 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

A time-dependent cylindrical computer simulation model approximating the actual geometry of the spacecraft is used to predict the potential acquired by the cylindrical Halley probe and the potential distribution in its vicinity. The primary sources of charge are impacts of cometary neutral-gas molecules producing secondary ion and electron pairs from the surface, and impacts of dust particles resulting in expanding dense plasma balls of dust and shield material. At 20000 km from the nucleus, the ion space charge due to neutral-gas-generated ions is dominant, while the electron space charge is of minor importance. Thus the electrons and ions are decoupled to zero order. Neglecting ambient plasma yields a upper limit of +20 volts for the spacecraft potential. The dominant ion charge, strongly concentrated just above the shield, generates a strong localized positive potential peak of order +37 volts just above the shield. A second model, a spherically symmetric steady-state model obtaining self-consistent solutions predicts a surface potential of 36 volts.
Author (ESA)

N81-34119# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
EXPERIMENTAL STUDIES OF IMPACT IONISATION c75
E. Gruen *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 81-90 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

Impact experiments for establishing the effects of impact ionization at hypervelocities are reviewed. These experiments simulate the situation of the Halley probe when it will penetrate the cometary coma and when it will be exposed to cometary dust at an impact speed of 57 km/s. The total yield of the impact charge Q (of both polarities) for a gold target at an impact speed of 57 km/s is given by Q = c m with c = 800 Coulombs/gram and m being the projectile mass. The uncertainty due to the unkown projectile material is within a factor of 3 for the given relation. The mean energy of the ions is 2eV at an impact speed of 10 km/s. An experiment which simulates the charging of a test body by impact ionization shows an equilibrium potential > or = 10 V (i.e., the collected positive and negative charges are balanced) for projectiles impacting at 20 km/s. Author (ESA)

N81-34120# Bern Univ. (Switzerland). Physikalisches Inst.
CONSEQUENCES OF THE COMA ENVIRONMENT OF COMET HALLEY FOR A FAST FLYBY SPACECRAFT c18
D. T. Young *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 91-96 refs Sponsored by ESA (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

A fast flyby (57 km/s) of the nucleus of comet Halley will produce limited spacecraft charging and a considerable amount of spurious plasma due to the impact of cometary dust and neutral gas. This will pose problems in certain aspects of the plasma measurements, because ambient cometary ions heavier than H^+ should have sufficient ram energy (17 eV/amu) to penetrate the probe potential barrier. They will be deflected and slowed down slightly by electric fields surrounding the probe. The deflection will be mass dependent due to the fact that all ions have nearly the same incident velocity regardless of mass. Other important factors include the finite impact parameter of ions reaching detectors mounted on the side of the probe and the non-uniform distribution of electric fields around the probe. The plasma analyzer and ion mass spectrometer both will have to contend with distortions of the electron and ion distribution functions due to these effects. Contamination of experiment measurements by the dense probe-induced plasma cloud is also important. Author (ESA)

N81-34121# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
SUMMARY REPORT OF FOLLOW-UP WORKSHOP c91
Rejean J. L. Grard *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 97-99 (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

The effects of sputtering and secondary emission can be reduced if the emitting surface has a honeycomb structure, is grooved or rough. The outer surface must be coated with a 10 micron layer of gold to reduce the number of emitted ions. Interactions between incident molecules and the spacecraft surface are not expected to increase the overall sputtering rate. Neutral gas density enhancement in front of the spacecraft is negligible because of few collisions between emitted material and the cometary wind. Computer simulations show that during the final phase of the encounter, the leading edge of Giotto will float at a potential of +10 V. Serious disturbances in the telemetry link can be expected for a few sec if closest approach is less than 100 km. If the spacecraft surface is not conductive, differential charging will occur and the surface potentials will lie within the range, -20 to +20 V. The outer surface of the shield will float at a positive potential; surfaces in the wake will develop, if insulated, a negative potential of at least -20 V. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N81-34122*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EXTENDED RANGE X-RAY TELESCOPE
Richard B. Hoover 15 May 1981 16 p refs
(NASA-Case-MFS-25282-1; US-Patent-Appl-SN-263828) Avail: NTIS HC A02/MF A01 CSCL 03A

An X-ray telescope system is described which is designed for use on sounding rockets and satellites to investigate solar X-ray phenomena and cosmic X-ray sources. The system comprises a tubular mount having a collecting region at one axial end for receiving X-rays from a remote source, and a detector region remote from the one axial end. A soft X-ray/XUV subsystem associated with the collecting region directs only relatively soft, near on-axis X-rays/XUV radiation incident on a first portion of the collecting region into a first detector. A hard X-ray subsystem associated with the collecting region directs only relatively hard near on-axis X-rays incident on a second portion of the collecting region into a second detector. NASA

N81-34123*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE THIRTEEN COLOR PHOTOMETRY OF 1380 BRIGHT STARS
Wayne H. Warren, Jr. and Nancy G. Roman Mar. 1981 14 p refs
(NASA-TM-84018; NSSDC/WDC-A-R/S-81-02) Avail: NTIS HC A02/MF A01 CSCL 03A

The magnetic tape version of the catalogue of thirteen-color photometry of 1380 bright stars, containing data on the 13 color medium narrow band photometric system is described. Observations of essentially all stars brighter than fifth visual magnitude north of delta = -20 deg and brighter than fourth visual magnitude south of delta = -20 deg are included. It is intended to enable

users to read and process the tape without the common difficulties and uncertainties. J.D.H.

N81-34124*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE CHARACTER CODED VERSION OF THE SKYMAP CATALOGUE
Wayne H. Warren, Jr. Jul. 1981 110 p
(NASA-TM-84019; NSSDC/WDC-A-R/S-81-05) Avail: NTIS HC A06/MF A01 CSCL 03A

The SKYMAP catalogue is a compilation of astronomical data prepared primarily for purposes of attitude guidance for satellites. In addition to the SKYMAP Master Catalogue data base, a software package of data base management and utility programs is available. The tape version of the SKYMAP Catalogue, as received by the Astronomical Data Center (ADC), contains logical records consisting of a combination of binary and EBCDIC data. Certain character coded data in each record are redundant in that the same data are present in binary form. In order to facilitate wider use of all SKYMAP data by the astronomical community, a formatted (character) version was prepared by eliminating all redundant character data and converting all binary data to character form. The character version of the catalogue is described. The document is intended to fully describe the formatted tape so that users can process the data problems and guess work; it should be distributed with any character version of the catalogue. J.M.S.

N81-34125*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE CATALOG OF 5,268 STANDARD STARS, 1950.0 BASED ON THE NORMAL SYSTEM N30
Wayne H. Warren, Jr. Jul. 1981 14 p refs
(NASA-TM-84021; NSSDC/WDC-A-R/S-81-08) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the N30 catalog available on magnetic tape from the Astronomical Data Center is described. Numerical representations of some data fields on the original catalog were changed to conform more closely to formats being used for star-catalog data, plus all records having asterisks indicating footnotes in the published catalog now have corresponding remarks entries in a second tape file i.e., the footnotes in the published catalog were computerized and are contained in a second file of the tape. A.R.H.

N81-34126*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASTRONOMICAL DATA CENTER BULLETIN, VOLUME 1, NUMBER 2
T. A. Nagy (Systems and Applied Sciences Corp.), W. H. Warren, Jr., and J. M. Mead Jul. 1981 123 p refs
(NASA-TM-84024; NSSDC/WDC-A-R/S-81-09) Avail: NTIS HC A06/MF A01 CSCL 03A

Work in progress on astronomical catalogs is presented in 16 papers. Topics cover astronomical data center operations; automatic astronomical data retrieval at GSFC; interactive computer reference search of astronomical literature 1950-1976; formatting, checking, and documenting machine-readable catalogs; interactive catalog of UV, optical, and HI data for 201 Virgo cluster galaxies; machine-readable version of the general catalog of variable stars, third edition; galactic latitude and magnitude distribution of two astronomical catalogs; the catalog of open star clusters; infrared astronomical data base and catalog of infrared observations; the Air Force Geophysics Laboratory; revised magnetic tape of the N30 catalog of 5,268 standard stars; positional correlation of the two-micron sky survey and Smithsonian Astrophysical Observatory catalog sources; search capabilities for the catalog of stellar identifications (CSI) 1979 version; CSI statistics: blue magnitude versus spectral type; catalogs available from the Astronomical Data Center; and status report on machine-readable astronomical catalogs. A.R.H.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N81-34127*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER AND THE ORIGIN OF THE SOLAR SYSTEM
A. J. R. Prentice 15 Aug. 1981 20 p refs
(Contract NAS7-100)
(NASA-CR-164850; JPL-Pub-81-79) Avail: NTIS HC A02/MF A01 CSCL 03B

A unified model for the formation of regular satellite systems and the planetary system is outlined. The basis for this modern Laplacian theory is that there existed a large supersonic turbulent stress arising from overshooting convective motions within the three primitive gaseous clouds which formed Jupiter, Saturn, and the Sun. Calculations show that if each cloud possessed the same fraction of supersonic turbulent energy, equal to about 5% of the cloud's gravitational potential energy, then the broad mass distribution and chemistry of all regular satellite and planetary systems can be simultaneously accounted for. Titan is probably a captured moon of Saturn. Several predictions about observations made by Voyager 2 at Saturn are presented. M.G.

N81-34128# Oxford Univ. (England). Nuclear Physics Lab.
PAIR FORMATION AND ELECTRIC FIELD BOUNDARY CONDITIONS AT NEUTRON STAR MAGNETIC POLES
P. B. Jones 1980 31 p refs
(PB81-213001; Rept-3/80) Avail: NTIS HC A03/MF A01 CSCL 03B

The results of detailed calculations of pair formation in the inner magnetosphere of a neutron star made under the assumption that the surface electric field satisfies E.B = 0 are given. It is assumed that high multipole components in the magnetic field increase the curvature of open flux lines and allow pair formation at the rotation period of the typical radio pulsar. A previous electric fields solution is shown (in a one dimensional approximation) to be unstable. No dense pair plasma is formed, even in the absence of the instability. The outward moving plasma consists largely of a single stream of electrons so tht for this boundary condition, there is no promising source of radio emission in the inner magnetosphere. GRA

N81-34114# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
ION-ELECTRON PAIR PRODUCTION BY THE IMPACTS ON THE HALLEY PROBE SHIELD
E. Gruen and R. Reinhard (ESTEC, Noordwijk, Netherlands) *In* ESA. The Comet Halley Probe. Plasma Environ. May 1981 p 7-21 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

N81-34115# Hochschule der Bundeswehr, Neubiberg (West Germany). Fachbereich Luft- und Raumfahrttechnik.
RESIDUAL IONIZATION AFTER IMPACT OF LARGE DUST PARTICLES
K. Hornung and S. Drapatz (Max-Planck Inst. fuer Extraterrestrische Physik) *In* ESA. The Comet Halley Probe. Plasma Environ. May 1981 p 23-37 refs (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N81-34129*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DATA ANNOUNCEMENT BULLETIN: VOYAGER 1 AND VOYAGER 2 JUPITER ENCOUNTER DATA
Dec. 1980 3 p
(NASA-TM-84017; NSSDC/WDC-A-R/S-80-13) Avail: NTIS HC A02/MF A01 CSCL 03B

Available data on imaging, infrared spectroscopy and radiometry, triaxial fluxgate magnetometers, the multifilter photopolarimeter, planetary radio astronomy, and radio science is described. The Voyager experiments are listed, and it is indicated on which experiments data is available. J.D.M.

N81-34130*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA USERS NOTE: LUNAR MAPS AVAILABLE FROM NSSDC
Robert W. Vostreys and William T. Sheridan Aug. 1981 25 p refs
(NASA-TM-84023; NSSDC/WDC-A-R/S-81-06) Avail: NTIS HC A02/MF A01 CSCL 03B

The types of maps available from the National Space Science Data Center/World Data Center A for Rockets and Satellites for the support of lunar and comparative planetology scientific investigations are identified and described. Information on other sources of maps useful to planetologists is included. The maps are listed according to increased map scale. Parameters given include the name, scale, date of edition, the four corner coordinates of each maps, and the NSSDC ID. A.R.H.

N81-34131*# California Inst. of Tech., Pasadena. Dept. of Astronomy.
SPECTROSCOPY OF COMET P/ENCKE IN 1980 - 1981 Final Report, 1 Aug. 1980 - 31 Jul. 1981
Hyron Spinrad 14 Aug. 1981 13 p refs
(Contracts NAS7-100; JPL-724869)
(NASA-CR-164866; Rept-1) Avail: NTIS HC A02/MF A01 CSCL 03B

Digital spectroscopic scans of P/Comets Encke, Stephan-Oterma, and Gunn were obtained with a sky-subtraction scanner system. Quantiative fluxes for the cometary emission bands of CN, C3, C2, NH2, and the 'D [OI] red auroral line are presented for P/Encke. The most straight-forward and model-independent line flux to interpret is the lambda lambda 6300, 6364 forbidden oxygen doublet. After an NH2 blending correction, the oxygen production rate may be directly measured from the Lick small-aperture fluxes. The oxygen production rates increased rapidly with decreasing heliocentric distance for both P/Encke and P/Stephan-Oterma. A rough power-law exponent in r with n = approximately -2.5 describes the change in oxygen production for P/Encke. Compared to the water production rates inferred from IUE satellite spectra showing the lambda 3080 OH band, these oxygen production rates are consistently lower by a factor of 11. This implies a common origin for the two species; H2O is the likely sole [OI] ID parent. A.R.H.

N81-34132*# California Inst. of Tech., Pasadena.
ENERGETIC OXYGEN AND SULFUR IONS IN THE JOVIAN MAGNETOSPHERE Ph.D. Thesis
Neil Gehrels 1981 135 p refs
(Contract NAGw-200)
(NASA-CR-164860; SRL-81-26) Avail: NTIS HC A07/MF A01 CSCL 03B

Observations of 1 to 20 MeV/nuc oxygen, sodium, and sulfur ions in the Jovian magnetosphere are reported. Measurements made by the cosmic ray subsystem on Voyager 1 and 2 were used to calculate abundances and energy spectra in the region from 5 to 20 Jovian radii. The phase space density of the oxygen ions calculated from the spectra has a positive radial gradient between 6 and 17 Jovian radii, indicating an inward diffusive flow. The diffusion coefficient upper limit at 9 Jovian radii is approximately 10 to the -5 power/s. This limit, combined with the analysis of Voyager plasma observations by Siscoe et al.[1981], implies an upper limit to the mass loading rate near Io of approximately 10 to the 28th power ions/s. The energetic oxygen lifetime is within an order of magnitude of the strong pitch-angle diffusion lifetime in this region, with the largest total number of particles lost between 7.5 and 12.5 Jovian radii. It is shown that the losses are not due to geometric absorption by Io, absorption by dust grains, or energy loss in the plasma of the inner magnetosphere, and it is therefore postulated that the primary loss mechanism is pitch-angle scattering into the loss cone. A.R.H.

N81-34133# Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
ORBITAL ELEMENTS OF MICROMETEOROIDS: ANALYSIS OF MEASUREMENTS OF HELIOS 1 Final Report
Klaus Dietrich Schmidt Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(Contract BMFT-WRS-0108)
(BMFT-FB-W-80-036; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16, 40

Experiment E10 on board HELIOS 1 is able to identify velocity and masses from 10 to the minus 17th power to 10 to the minus 6th power gram of interplanetary micrometeorites in the inner solar system (0.3 AU-1AU). The measurements provide information about the dynamics of the dust cloud and indications about the sources and sinks of those particles. Calculations show that detected micrometeorites with mass > 10 to the minus 11th power gram represent the dynamic properties known from optical measurements. Smaller particles (mostly on hyperbolic orbits) give rise to the assumption that collisions of larger particles are their source. Author (ESA)

N81-34121# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
SUMMARY REPORT OF FOLLOW-UP WORKSHOP
Rejean J. L. Grard *In* ESA The Comet Halley Probe. Plasma Environ. May 1981 p 97-99 (For primary document see N81-34113 24-88)
Avail: NTIS HC A06/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

No abstracts in this category.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N81-34134# Naval Research Lab., Washington, D. C.
COSMIC RAY EFFECTS ON MICROELECTRONICS. PART 1: THE NEAR-EARTH PARTICLE ENVIRONMENT
J. H. Adams, Jr., R. Silberberg, and C. H. Tsao 25 Aug. 1981 95 p refs
(AD-A103897; NRL-MR-4506-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 03/2

It has recently been recognized that a single intensely ionizing particle can alter the information stored in a modern semiconductor memory and possibly do permanent damage to the microelectronic circuit involved. Such particles are common in nature and abundant in space. This report describes the natural particle environment in which modern space-borne electronics must operate, and provides a simple but accurate empirical model of that environment. Author (GRA)

99 GENERAL

N81-34135# Naval Research Lab., Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 13, NUMBER 8
Judith Nagle-Eshlemen, ed. Aug. 1981 97 p refs
(AD-A103906) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D C 20375; $15.00/set CSCL 05/8

Biodynamic responses of the human body to vibration and the analysis of materials fatigue and fatigue crack growth are considered. For individual titles, see N81-34136 through N81-34137.

N81-34136# Southampton Univ. (England). Inst. of Sound and Vibration Research.
BIODYNAMIC RESPONSE TO WHOLE-BODY VIBRATION **c54**
M. J. Griffin *In* The Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. 8 Aug. 1981 p 3-12 refs (For primary document see N81-34135 24-99)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 05/8

Experimental studies of biodynamic response to vibration and some attempts to model this response are reviewed. It is proposed that biodynamic models should be classified according to their general application. It is shown that the responses of the body to vibration are highly varied and that there is a need for increased availability of experimental biodynamic data. Author

N81-34137# Battelle Columbus Labs., Ohio.
THE ROLE OF SIMILITUDE IN FATIGUE AND FATIGUE CRACK GROWTH ANALYSES **c39**
B. N. Leis and D. Broek *In* The Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. 8 Aug. 1981 p 15-28 refs (For primary document see N81-34135 24-99)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

The role of similitude between damage states being compared during fatigue analyses based on laboratory specimen tests is considered. Developments pertinent to ensuring similitude in damage processes are reviewed. Measures of damage, crack nucleation, crack growth, and the marriage of nucleation and growth analysis are described. Multiaxial, thermal, and environmental effects are considered. When care is taken to ensure similitude at critical locations such as notch roots and crack tips, accurate predictions can be made of structural fatigue resistance based on laboratory test data. Four areas of future research are identified as significant. J.D.H.

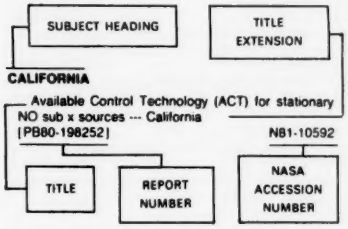
N81-34138*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH CENTER PUBLICATIONS: A CONTINUING BIBLIOGRAPHY, 1981
Aug. 1981 261 p
(NASA-TM-81308; A-8655) Avail: NTIS HC A12/MF A01 CSCL 05B

Thes bibliography lists formal NASA publications, journal articles, books, chapters of books, patents, contractor reports, and computer programs that were issued by Ames Research Center and indexed by Scientific and Technical Aerospace Reports, Limited Scientific and Technical Aerospace Reports, International Aerospace Abstracts, and Computer Program Abstracts in 1980. Citations are arranged by directorate, type of publication, and NASA accession numbers. Subject, personal author, corporate source, contract number, and report/accession number indexes are provided. A.R.H.

N81-34139# National Research Council of Canada, Ottawa (Ontario). Center for Space Science.
SPACE AND UPPER ATMOSPHERE PROGRAMS IN CANADA, 1980
May 1981 157 p
Avail: NTIS HC A08/MF A01

Activities of departments and agencies of the Canadian Federal Government as well as of universities and industries in that country are summarized. Topics covered include the design of experiments, instruments, and telemetry systems for investigations of space plasmas, ionospheric propagation, and electromagnetic fields. Technology development for international ventures in environmental monitoring, Earth resources surveying, search and rescue operations, and specific NASA and ESA programs is discussed as well as the objectives of various programs using satellite, balloon, and rocket sounding of the upper atmosphere. A.R.H.

Typical Subject Index Listing



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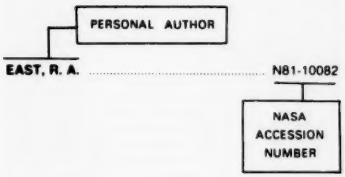

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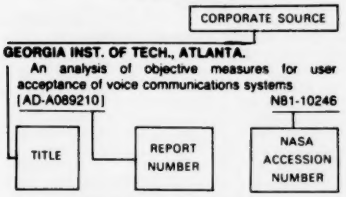

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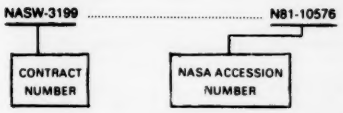

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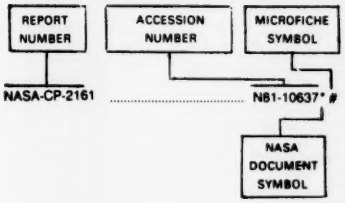

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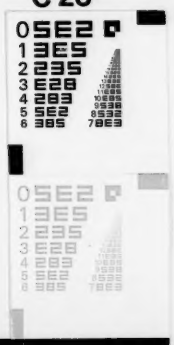
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